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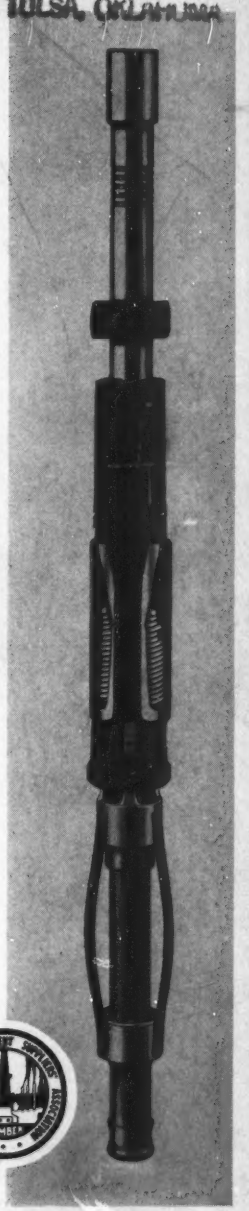

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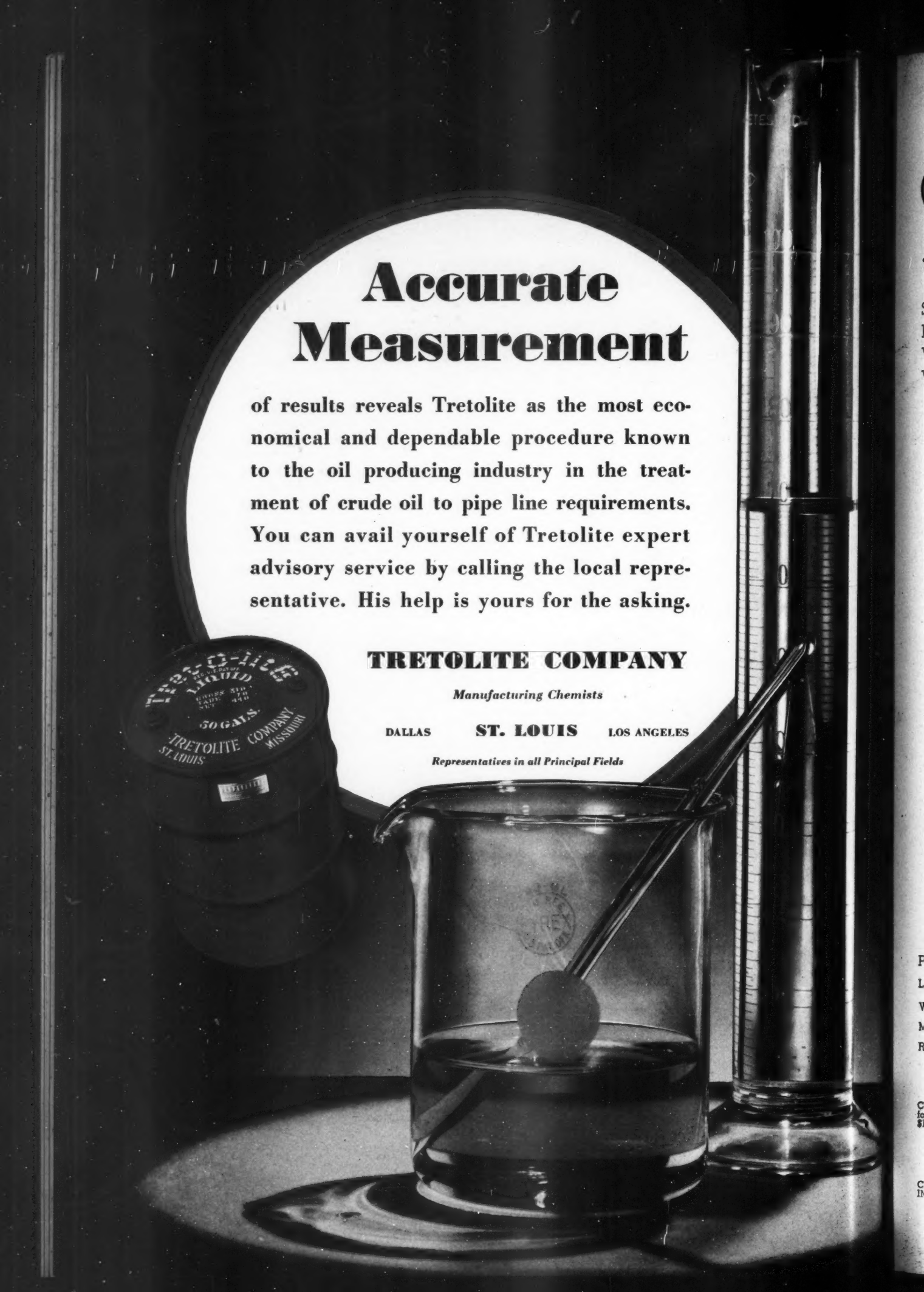
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December 20, 1938

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General Report on Wilmington Oil Field

California is Made by Engineer

By A. W. Nash*

The Wilmington oil field is located 20 miles due south of Los Angeles on the coast line of the Long Beach-Los Angeles Harbor area, Los Angeles County, California. The present extent of the developed area is about 3½ miles northwest and southeast, which is approximately parallel to the axis; by two miles in width. The limits of production have not been determined to date. The southeastern limit of development of the field, in the Long Beach Harbor area, is determined by the coast line and the Los Angeles County Flood Control Channel. The latter is now the barrier to development eastward, since drilling is prohibited east of the Flood Control Channel by city ordinance. There are no marked topographic features, the area being generally composed of low flat terraces which were cut by the Los Angeles river. The entire southeastern half of the field is located upon terrain which some maintain was in parts originally tideland. These claims have instigated considerable legal activity which has not been settled satisfactorily as yet.

The first wells in the Wilmington area were drilled during the close of developments at Torrance when operators were seeking a southeastern extension. Low structural positions and definite edge indications retarded exploration. In the latter part of 1931 the Ranger Petroleum Company started their Watson No. 2 about 1¾ miles southeast of the outpost wells of Torrance. The completion of this well January 26, 1932 from 3786 feet with an initial production of 75 barrels of 13.0 API gravity oil marked the discovery of the Ranger Zone, as the Repetto producing horizon was subsequently called. The present northern limits of development are about three quarters of a mile south of the discovery well, which is on the northwest flank of the Wilmington structure.

During 1935 and 1936 several operators found better production to the southeast of the discovery well. At that time some of the major operators became interested in the area. As a result of seismograph surveys and other studies, the General Petroleum Corporation drilled Terminal No. 1, located on the south flank in the central area, during the latter part of 1936. The well was carried down to a total depth of 6814, reaching the schist basement and encountering three new productive intervals, the Tar Zone, above the Ranger, and Terminal and Ford Zones below. Mechanical troubles while testing the lower showings made abandonment of that portion advisable. The hole was plugged to 3625 feet and completed December 6, 1936 with an initial production of 1400 barrels of 20.0° API oil and thus became the discovery well for the Terminal Zone or upper portion of the Miocene section. The lowest producing horizon was named for the first well to be completed in that zone, General Petroleum's Ford No. 3, which was placed on production in July, 1937. Drilling increased rapidly during the spring of 1937 and reached a peak by midsummer as operators developed the central portion of the field and the Wilmington town lot area. (See Plate I.) Activity declined during the fall and winter only to climb upward again in the Spring of 1938 following the opening to drilling of the Long Beach city area in November, 1937. A second peak, slightly below the first was reached during March, 1938. Under the influence of curtailment which became effective June 1, 1937 and the restricted drilling programs of major operators, the decline in activity was steady until October of this year when a slight upturn was shown.

A. W. NASH

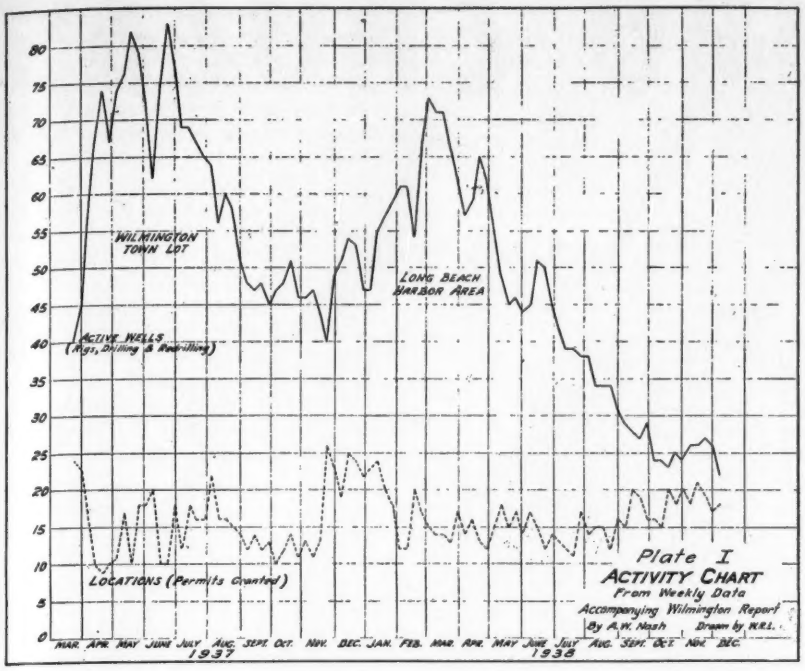
The Wilmington oil field is producing from the lower Pliocene (Repetto) and upper Miocene (Puente) formations which are correlative with the productive horizons in the Torrance, Dominguez and Long Beach fields. However, the entire section is somewhat thinner in Wilmington than in the surrounding area.

The Quarternary alluvium of the area is underlain by sand, gravel and clay beds which are unconformable to the Pico, (upper Pliocene). These surface beds contain fresh water, as shown from the occasional failures of surface shutoffs and by the electrical logs. The thickening of upper Pliocene sand members basinward results in an unconformity between the upper part of the Pico (upper Pliocene) and the Repetto (lower Pliocene) on the highest part of the structure in the Long Beach Harbor area. In the central and northwest portions of the field a disconformity results from the over lapping of the middle Pico by the upper Pico. The middle Pico thins on the crest, mostly by sand changes. There is also an unconformity between the middle Pico and the Repetto. Within the Repetto the shales are very consistent and thinning of the interval is due to the change in sand thicknesses.

The top 100 feet of the upper Puente (upper Miocene) shows a predominance of diatomaceous shales. These are underlain by about 100 feet of platy brown massive "poker chip" shales which are also highly diatomaceous. The contact with the overlying Repetto is normal. The upper Miocene contains a high percentage of sand, which yields the bulk of the production obtained from the field at present. The formations of the middle Miocene, the top of which is found at about 6425 in the western fault block, extend down to the Franciscan (Jurassic) schist which was encountered at 6787.

While microfaunal data was largely used by some operators to determine marker horizons during the early development of the field, the electrical logs offered such a quick and reliable means of correlation that they supplanted coring to some extent. The abundance of electrical logs has been of great assistance in quickly building up and interpreting the subsurface structural maps and sections of the Wilmington field. As more wells have been drilled, they have filled in the former blank spots, usually fitting into previous sections with very little adjustment save where occasional faults have been encountered. Type sections for various areas were established early in the history of the field and have remained practically unchanged. The principal shale and sand markers used

*Petroleum Engineer, The Hall-Baker Co., Operators for Union Pacific Railroad Co. Oil Properties in Wilmington.



for correlation purposes on the electric logs are readily identified. When development of the Long Beach Harbor area first started, there was very little difficulty in establishing correlations in spite of minor variations in sedimentation between that area and the nearest wells in the Central area nearly a mile away.

The Wilmington oil field lies northeast of the uplifted Palos Verde Hills and on the outer or southwestern line of fields of the Los Angeles Basin. The Torrance-Redondo field is regionally related to the Wilmington field. There is very little surface evidence of a structure as most of the area has been eroded to near tide level by the old Los Angeles River.

The subsurface structure shows the field to be an irregular shaped anticline with major faulting across the axis. The axis has the northwest-southeast trend common to the Basin oil fields, with the major faults striking approximately north and south. Faulting is predominantly of the normal type, with the eastern side downthrown. One small fault in the central portion of the field is apparently a westward dipping normal fault, forming the eastern boundary of a downthrown block or "graben." Clear evidence is lacking at present, but it is believed that other similar faults will be found when additional wells are drilled in the central area.

There are seven normal faults identified in the field at present, with only three being classified as major faults. The first major fault on the western side of the field is called the Wilmington fault. In the northwestern portion of the field this forms the eastern boundary of an area of wells with small production, with a minor fault forming the western boundary. The southern limits of the minor fault are not clear, but apparently it dies out in a short distance south of Anaheim Street. The next major fault is the Ford, which crosses the northeastern corner of the property of that name in the central portion of the field. The third major fault is the Long Beach Harbor fault, which has a pronounced influence on the productive horizons in the eastern part of the field in the Long Beach Harbor area. East of this fault only the Ranger zone is generally productive. Formations in the Miocene section have been found oil bearing only in the Lower Terminal zone in an area east of the Long Beach Harbor fault and to the west of the most easterly fault encountered in the field. This latter fault will probably for this reason prove to be the fourth major fault in the field.

. Faulting in the Wilmington field apparently died out in the Pliocene period, since there is very little evidence of disturbance of the upper beds to be noted on the subsurface sections. The activity of the faults during the lower Pliocene is indicated by the differences in sedimentation on the various blocks. The displacement on the majority of the faults increases rapidly with depth between the lower Pliocene and upper Miocene, but the Miocene stratigraphy is nearly uniform, suggesting that fault activity began near the close of the Miocene period.

There are five producing zones in the Wilmington field. In order, from top downward they are the Tar Zone, Ranger Zone, Upper Terminal Zone, Lower Terminal Zone and Ford Zone.

The Tar Zone is in the Repetto or lower Pliocene and is from 100 to 300 feet thick. Very few wells produce from the Tar Zone alone, most combining it with the Ranger Zone. The maximum thickness of the oil sand amounts to about one third of the total thickness of the zone. The sands vary from very fine and silty near the top to coarse near the bottom of the zone. The top is encountered at about 2200 in the structurally highest wells and has been proved productive well down on the northwest flank on the western block. The oil is low in gravity, varying from 12.5° to 15° API, and initial productions range from 200 to 400 barrels per day per well.

The Ranger Zone is also in the Repetto or lower Pliocene. The top of the Ranger is encountered at about 2350 feet in the highest wells and has a thickness of from 250 to 350 feet above the top of the Miocene. The total interval from the base of the Tar Zone to the top of the Upper Terminal averages 600 feet. Comparatively few wells produce from the full 600 foot interval. In the lower structural positions the base of the producing interval is approximately the top of the Miocene due to encroaching waters in the 200 foot shale-sand complex between that point and the top of the Upper Terminal. The gravity of the oil varies from 14.5° to 24.3° API, with initial productions of from 50 to 2500 barrels per day according to the structural locations. The principal productive sands are found in the upper 200 feet of the zone, while the lower portion consists mostly of shale with thin lenses of oil sand. The zone contains 20 to 35% oil sand, which varies from coarse grained in some of the larger bodies to very fine silty sand in the lenses. Productions up to 100 barrels per foot of oil sand present in the combined Tar and Ranger Zones have been recorded, with the maximum obtained in a well containing less than 30 feet of sand and located some distance from the crest of the structure.

The Ranger zone is the most widely productive formation in the Wilmington field, undoubtedly extending northwestward toward the Torrance field some distance beyond the present area of development. The exact limits of production have not been determined in any direction as yet. There is the possibility of an extension northwestward if another north-south fault should be encountered on the west side of the field. However, it is doubtful if commercial wells can be obtained much lower on the known structure than at present unless

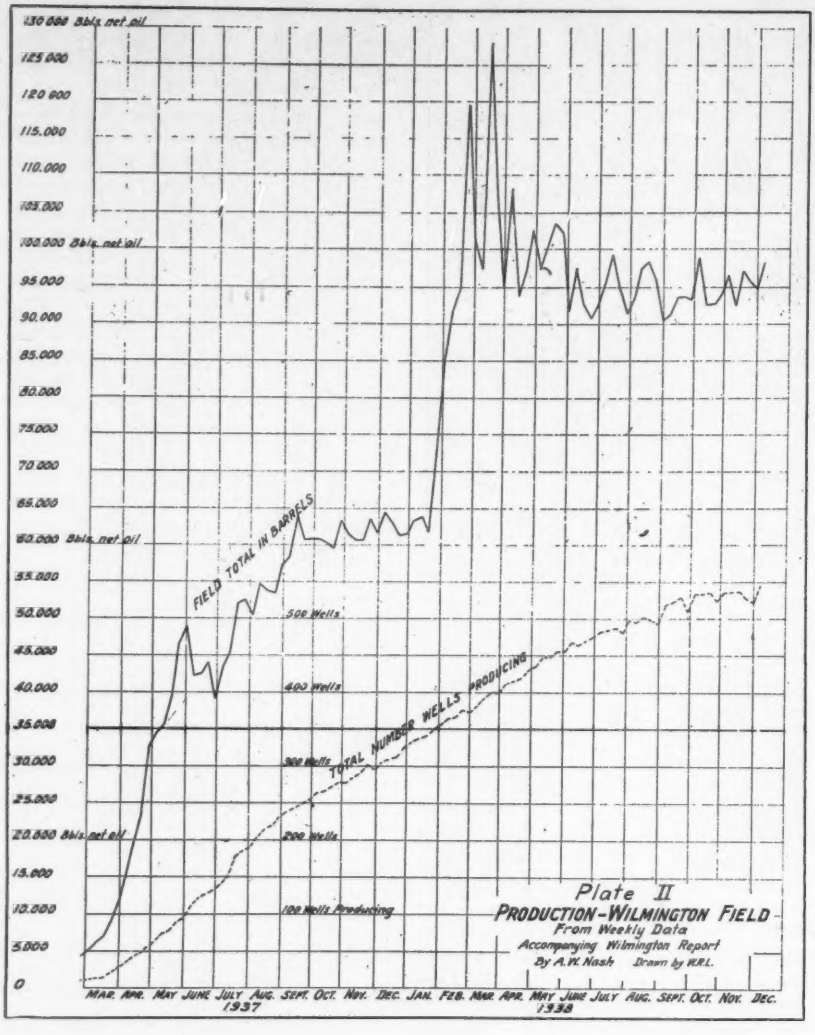


Plate II
PRODUCTION-WILMINGTON FIELD
From Weekly Data
Accompanying Wilmington Report
By A.W. Nash Drawn by W.R.L.

there are radical improvements in production methods and equipment.

The Terminal Zone, which is in the Puente formation (Upper Miocene), is subdivided into Upper and Lower members by an intermediate water found on the flanks. In the structurally higher wells, this water is represented by a weak interval that extends well up toward the crest of the structure. The top of the Upper Terminal is about 200 feet below the top of the Miocene or at about 2850 feet in the highest wells. The zone is from 450 to 550 feet thick and the sand content is unusually high, being approximately 65%. The gravity of the oil in the Upper Terminal varies from 17.0° to 26.5° API. Initial productions range from 300 to 3500 barrels per day. The top of the Lower Terminal Zone is found at about 3400 feet in the highest wells. The average productive interval open in the structurally high wells is 600 feet, although the lower limits of the zone have not been determined. The sand content of the Lower Terminal is approximately 50%. The gravity of the oil varies from 27° to 31.5° API. The Lower Terminal ordinarily is not produced alone, so that initial productions are estimated at 2500 to 4500 barrels a day. Maximum productions up to 10,000 barrels a day are indicated for crestal wells combining the Upper Terminal and Lower Terminal Zones.

The Ford Zone is in the lower portion of the Upper Miocene and is approximately 600 feet thick. There is an interval of barren gray sands between the lowest Terminal showings and the top of the Ford Zone. Approximately 65% of the zone is sand, but due to the low porosity, the productive sands are probably limited to 25 or 30% of the total. The top is encountered at 4850 feet in the structurally highest wells in the central area and at 5100 feet in the western fault block. The gravity of the oil varies from 27.5° to 32.0° API. Initial productions of from 100 to 900 barrels per day have been obtained. The present active development of the Ford Zone is concentrated in the area immediately west of the Wilmington fault in the southern portion of the town lot area. The Ford Zone is not found productive east of the Long Beach Harbor fault at present.

There are no indications of high pressure gas zones such as are frequently found overlying the oil measures in other Los Angeles basin fields. There is an interval of about 200 feet above the top of the Tar Zone which contains heavy oil-bearing sands in some portions of the field, notably east of the Long Beach Harbor fault. A number of probably water-bearing sands are indicated in cored sections, so that it is doubtful if production could be obtained.

Gas-oil ratios are generally very low, since most of the wells yield a very small volume of gas. The rate of gas production increases with the increase of oil production. The gas is collected and treated at two plants in the field, with that from the Long Beach Harbor area being piped to Signal Hill for treatment. The gasoline content varies from 0.5 to 2.5 gallons per thousand cubic feet, with the average between 1.5 and 2.0 gallons.

Subsurface pressure surveys and well performances indicate that the production in the Wilmington field is due chiefly to water drive. There are irregularities in the accumulation that are difficult to explain, with additional questions being raised by recent developments in the Long Beach Harbor area. There, three wells drilled in the area east of the Long Beach Harbor fault where only Ranger productions was anticipated, encountered oil in the Lower Terminal Zone, below a north-south normal fault about one-quarter of a mile east of the main fault. The Upper Terminal is barren throughout the area.

The drilling campaign in Wilmington brought forth an array of the latest improvements in methods and equipment for oil field development. Seismograph surveys were made of the field before drilling began and magnetometer surveys have been made subsequently. Directional surveys are required by the city of Long Beach before setting casing in wells in that area, and have been used in other special cases. An occasional operator doing exploration work has utilized the familiar method of core orientation or the newly developed method of orientation by residual magnetism.‡ Core analyses have been made to determine saturation, porosity and permeability. Thermal surveys to locate the top of cement behind casing have been used successfully in a number of wells. After completion, both pressure bombs and the Depthograph have been utilized for studying production problems.

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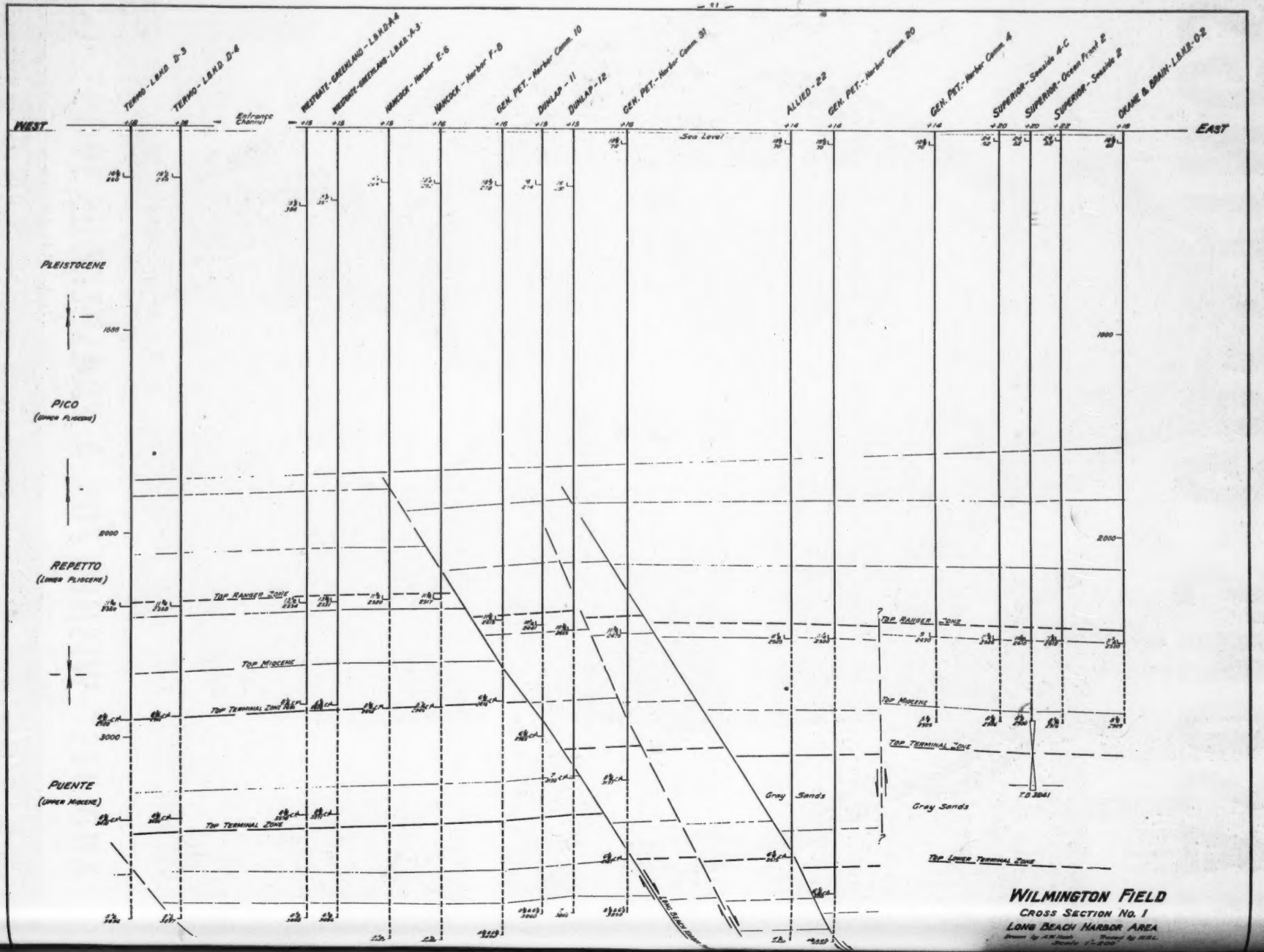


WILMINGTON FIELD

CROSS SECTION No. 1

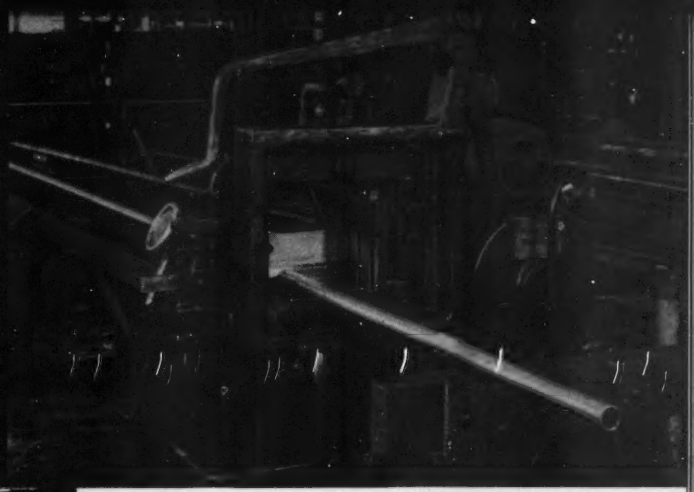
LONG BEACH HARBOR AREA

Drawn by A.M. Nash Traced by M.M.L.

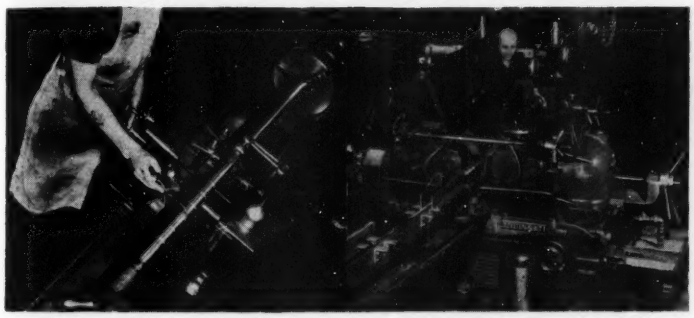
Scale: 1"=200'

LIFE

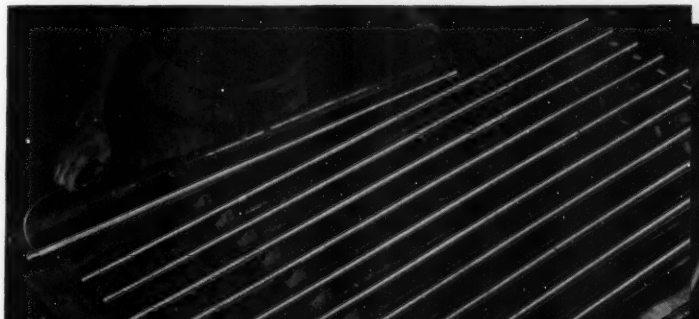
AT THE BOTTOM OF YOUR WELL



2. Heat treating Super-Service Plungers.



3. Testing Super-Service Plungers for hardness.



4. Turning grooves in Plungers.

5. Polishing Plungers to mirror finish.

6. Resting on fibre-covered racks, Axelson plungers are gaged and stamped to show exact diameter. After exact gaging, no hand touches the surface. They are transferred to the de-greasing and rust-preventing departments with bronze hooks inserted in the ends, to prevent the slightest scratch or blemish on the polished surface.

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Actual drilling of the wells has not involved any special problems, and for the most part operators have used comparatively light equipment. In the initial drilling campaign, considerable difficulty was caused by the excessive abrasive action of the sand carried in the drilling fluid. The installation of vibrating screens, longer settling ditches and more careful control of the mud has done much to improve conditions. The average depth of wells completed in the Lower Terminal is about 4000 feet, while those in the Ford Zone are bottomed around 5700 feet. Steam, butane and electricity have been used satisfactorily as power. Drilling time has varied from a record of 13 days total for a Ranger Zone well to an average of 30 days for Terminal Wells and about 45 days for Ford Zone completions in new holes. A large number of the wells producing from the Ford Zone in the western block have been deepened from one of the upper zones.

Repressuring the oil measures with surplus dry gas from the field is now being tried in an experimental well. The Ranger Zone was selected for the first test. Operations have not been under way long enough for any definite conclusions to be made. With a few, the effects of curtailment have been lessened to some extent by the fact that they have been able to shut in the low gravity production and fill their quota with the higher gravity and higher priced oil obtained from the deeper zones. Curtailment of production has been generally observed by the operators since it went into effect in June 1937, so that the field production has remained close to the allotment. It has been necessary to reduce the allowable production per well several times during recent months in order to offset new completions and to maintain the field total within the limits set. The Oil Umpire's office reported the November 1938 potential for the Wilmington field as 475,000 barrels, with a daily allotment of just under 70,000 barrels. Actual daily production during the month of November was approximately 95,000 barrels. (See Plate II.)

The method of utilizing drillable casing to facilitate future repair work was first used on an extensive scale in the Wilmington field. Drillable casing has found ready application in other fields, notably in the recent deep developments on the floor of the San Joaquin Valley. In Wilmington the practice has been to use drillable casing for the top section of liners in order that the old casing may be easily sidetracked when redrilling is required. Another use is the inclusion of blank drillable section in the oil string at points opposite shales in the producing interval where future repair programs may establish an effective plug to exclude encroaching waters. Drillable casing has also been used for reinforcing sleeves which are set opposite intervals where the original casing was found partially collapsed. By using a short section with packers at both top and bottom, the movement of fluid and sand is restricted and it is expected that the productive period will be prolonged before more extensive repairs are required.

Very little difficulty has been encountered with water problems in the field. Consequently no comprehensive study has been made, although the waters obtained from the various zones have been analyzed. The chloride content is not distinctive enough to serve for an identification of the source. One effective method of excluding bottom water has been to plug with cement in the usual manner to a point about 10 feet below

‡"Laboratory Orientation of Cores by their Magnetic Polarity." E. D. Lynton, Bulletin of A.A.P.G., Vol. 21, No. 5, May 1937.

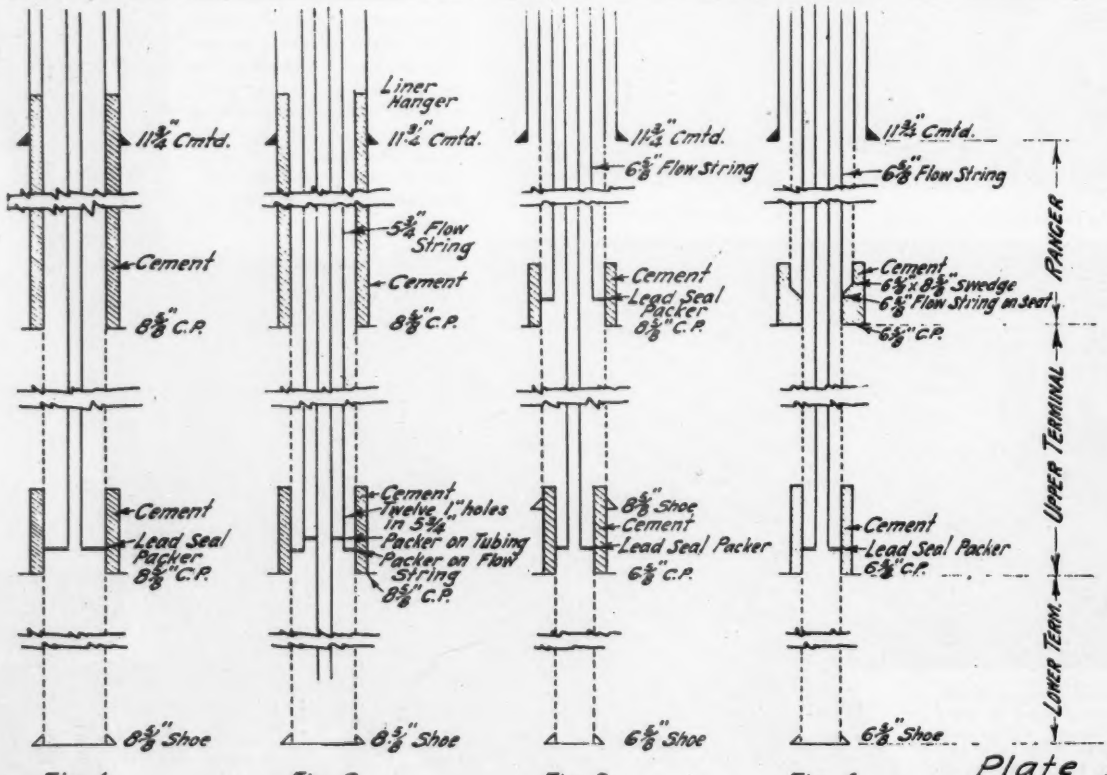


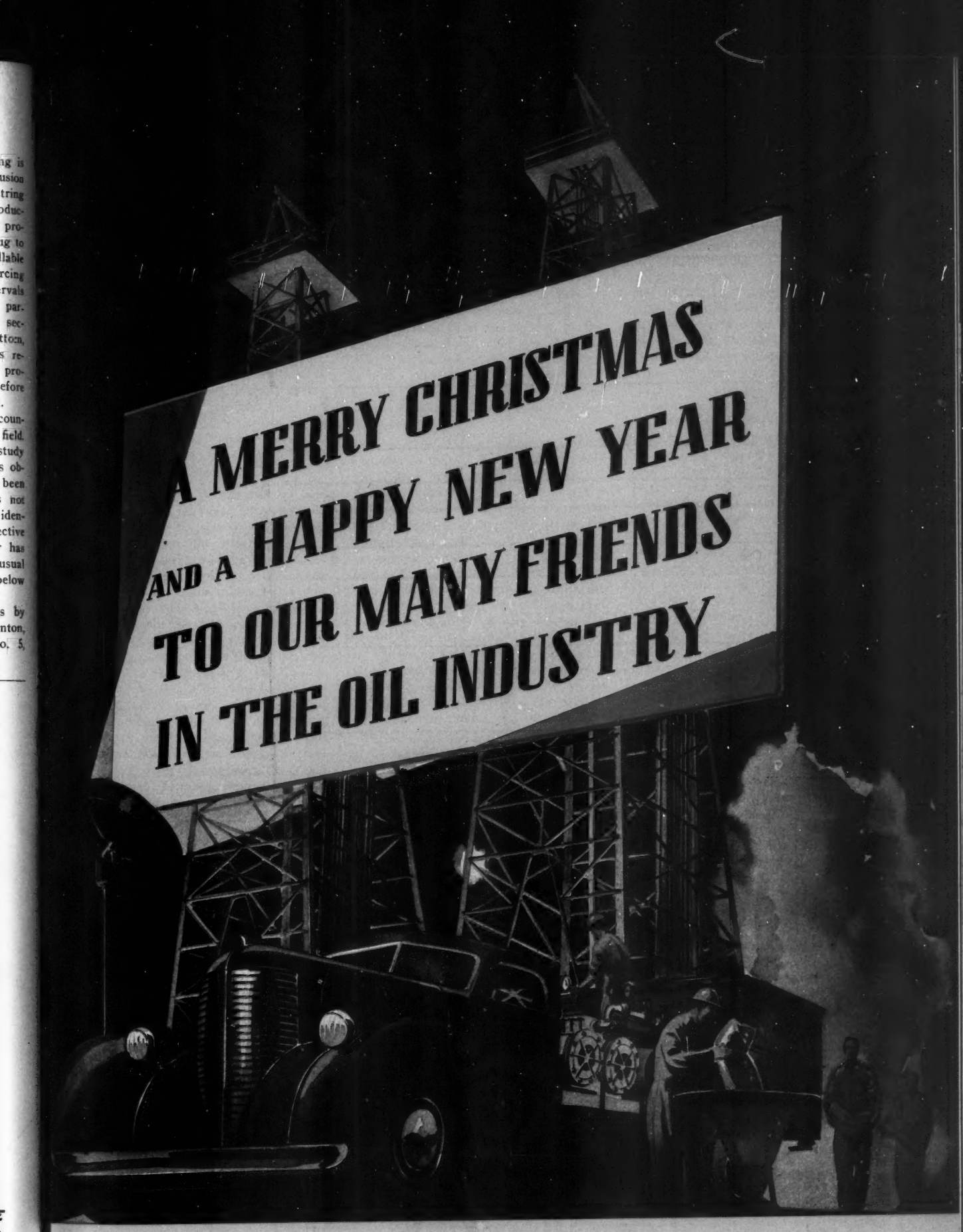
Fig. 1 — 2 ZONE

Fig. 2 — 2 ZONE

Fig. 3 — 3 ZONE

Fig. 4 — 3 ZONE

Plate III
MULTIPLE ZONE CASING PROGRAMS
Accompanying Wilmington Report
By A.W. Nash Drawn by W.R.L.



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WILMINGTON FIELD
CROSS SECTION No. 4
LONG BEACH HARBOR AREA
Drawn by A.M. Kash Traced by R.E.L.
Scale 1" = 200'
WEST
EAST
Union Pacific - E-6
Hancock - Harbor A-3
Hancock - Harbor A-2
Hancock - Harbor A-1
G.H. Pet. - Harbor Comm. 16
Banning - U.P. 6
Banning - U.P. 11
G.H. Pet. - Harbor Comm. 44
Channel - Harbor E-1
G.H. Pet. - Harbor Comm. 2
Allied - 27
Allied - 29
G.H. Pet. - Harbor Comm. 39
G.H. Pet. - Harbor Comm. 41
G.H. Pet. - Harbor Comm. 45
Sea Level
Elevations
Top Ranger Zone
Top Terminal Fault
Top Pliocene
Top Terminal Zone
Top Lower Terminal Zone
Gray Sands
Long Beach Harbor Fault
PLEISTOCENE
PICO (Upper Pliocene)
REPETTO (Lower Pliocene)
UPPER PUENTE (Upper Miocene)

the desired top of the final plug. The liner is then run with an open shoe and set with a hanger. Cement is dumped on bottom and shot while wet with a small charge of gelatin, after which enough additional cement is placed to bring the top of the final plug above the shoe of the liner. This treatment has been effective in excluding water in cases where the usual method had been tried first and found unsatisfactory. Intermediate waters have been excluded by cementing blank casing, placed opposite the wet interval, through perforations in the usual manner. In the case of extremely long blank intervals, two cementing points have been used to insure a satisfactory collar of cement, with one point located at the bottom of the interval and the other near the top.

Operators in the Wilmington oil field have utilized and improved upon the technique of drilling multiple zone producing wells. Basically, the practice consists of separating the producing horizons by means of cement outside of the casing and by packers on the tubing or on flow strings inside. The number of zones that may be produced in combination in a single well is limited in the Wilmington field by common agreement among the operators at the instance of the California State Division of Oil and Gas. Thus Tar and Ranger zones may be combined, or the Ranger and Terminal, but all three may not be produced in the same well. The multiple zone wells with three productive intervals produce from the Ranger and Terminal zones, with the latter divided into Upper and Lower Terminal intervals.

The varying pressures within different zones makes separation advisable for wells which produce from two or more zones. The multiple zone method permits an initial economy by making one hole serve for the production of two or three intervals. It is especially adapted to areas where drilling sites are at a premium, since it increases the number of offset obligations that may be met. However, in practice the uppermost zone is seldom flowed to good advantage, due to the relatively large surface area of the fluid column. Under the curtailment in effect at present, the upper or Ranger zone is shut in on a majority of the multiple zone wells.

In the various casing programs, full combination strings and liners are used, both sometimes tapered from 8⅝" to 6⅝". A combination of the two may be utilized by setting an oil string for the upper zone with a liner for the lower zone cemented through perforations with sufficient cement to splice it to the shoe of the oil string. Sectional liners are also used with good results, or a combination of sectional liner and full oil string landed in a mating sleeve.

In practice there are numerous combinations used to achieve the same results, each particular casing program and cementing method having its adherents. The simplest two zone separation may be made by cementing an oil string through perforations at the dividing shale with sufficient cement to form a collar around the blank interval and then setting a packer on the tubing in the dividing blank pipe. (See Fig. 1, Plate III). The casing head is then connected up so that the lower zone is flowed through the tubing and the upper zone is flowed from between the tubing and the water string.

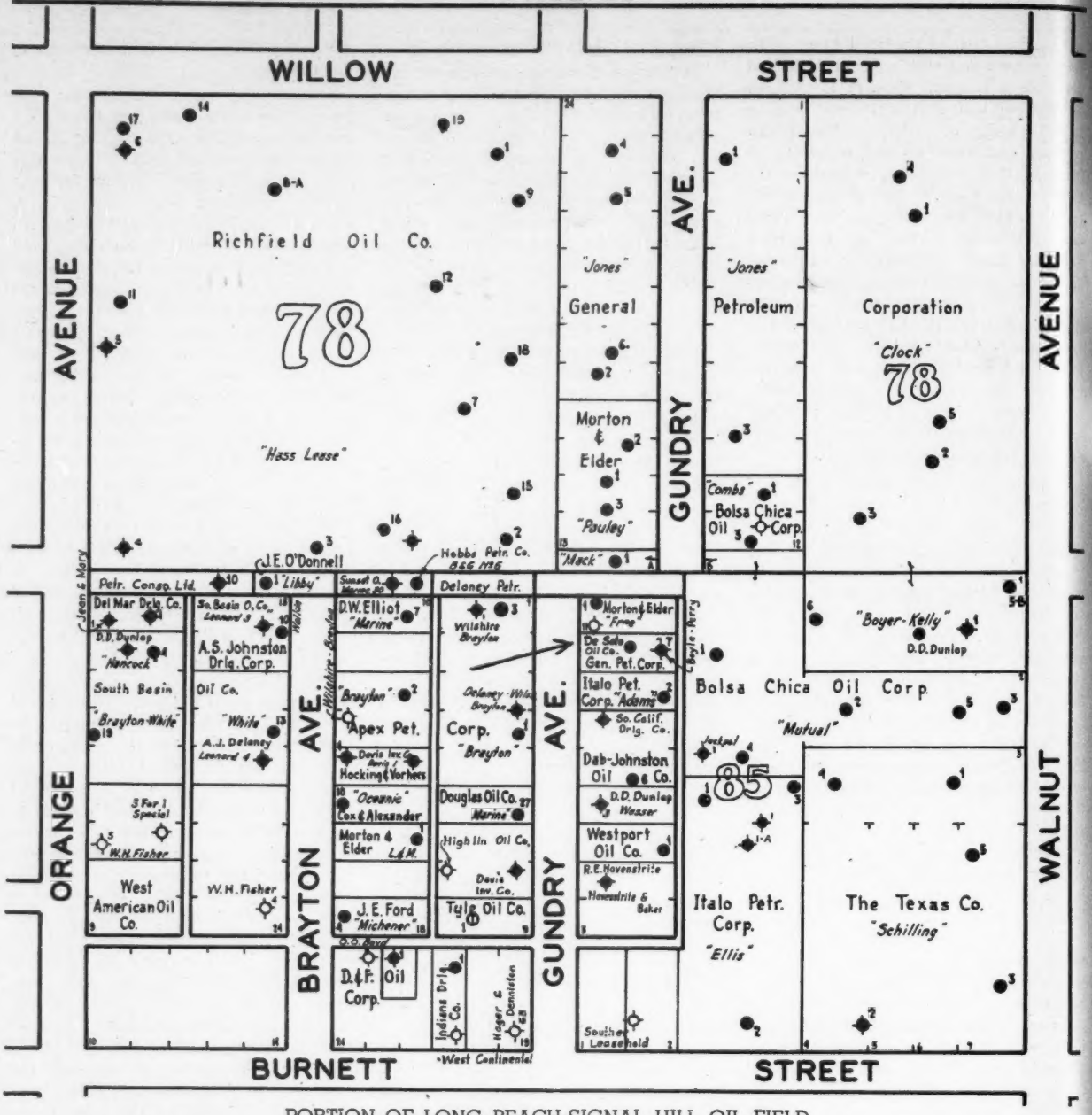
A variation of this two zone method is shown in Fig. 2, Plate III. In this case a flow string with ten or twelve one inch holes near the bottom of the perforated interval and just above the packer is landed on a packer set in the dividing blank pipe. The method reduces the annular flow space for the upper zone and is intended to keep the hole clean by flowing from bottom. With the latter purpose in view, the tubing is also run to within forty or fifty feet of the bottom of the hole with a packer set near the bottom of the flow string. This method has only been applied to Terminal zone wells to date and appears to be satisfactory in operation at the present low rate of production.

Three zones are produced separately in the same well by utilizing tubing and flow strings, each landed on packers. One major operator uses the program of an 8⅝" combination string with an intermediate cementing point and two perforated intervals, with a 6⅝" liner cemented to the shoe of the 8⅝" string. (See Fig. 3, Plate III). In practice the 8⅝" combination string is run in and cemented. After standing for cement to harden, the plugs are drilled out and the 6⅝" liner run in and cemented. This procedure has as an advantage the control of the cement to prevent clogging perforations or sealing off any productive sands by washing back the excess immediately. The flow string is then landed on a packer in the upper blank interval and the tubing packer set in the lower blank. The well is produced with the lower zone flowing through tubing, the middle zone through the flow string and the upper zone between the flow string and casing. An innovation is the utilization of special recessed collars for seating the lead seal packers on tubing and flow string. The drillable packers are fitted with expanding lugs which will not catch in the normal recess of a coupling but do seat on a shoulder in the longer recess provided in the special coupling. This type of packer may be moved and reset if necessary and is also provided with circulating jars to facilitate washing the well.

Another major operator uses the program of sectional liners together with a combination string, a flow string landed on a special ground seat in a swedge joint and tubing with a packer for producing three zone wells. (See Fig. 4, Plate III). The uppermost section of the liner is fitted with the special ground joint swedge into which the shoe of the flow string fits. In this case each section is landed and cemented before the next section above is run in. After cementing it is only necessary to clean out the surplus cement above the top of the liner and in the mating sleeve before running the next section. Consequently it is possible to use a considerable excess of cement to insure a satisfactory collar without any fear of clogging perforations or formation. An advantage of this procedure is that the sections can be run and cemented consecutively without waiting for the cement to harden. If necessary, any interval can be tested prior to setting additional pipe by landing a packer in the blank casing on the top of the section.

Several operators are experimenting with gravel packed liners. The method seems to have achieved its primary purpose, that of reducing the amount of sand entering the well, but has created other problems that can be answered only after a considerable lapse of time in which to observe the production characteristic of wells so treated in comparison with those completed in the usual manner. In wells with gravel packed liners, the hole is underreamed to a considerably larger diameter than usual, for example, to 17" for a 6⅝" liner. Then, after landing the liner, the space between the casing and the wall of the hole is filled with fine gravel. That used most commonly is from ⅛" to 1-10" in diameter. A number of methods are employed to introduce the gravel into the hole, all based on the principle of conveying it in the mud stream with circulation reversed. There are a number of mechanical problems yet to be solved before the operation can become thoroughly trouble free, but rapid advances have been made in the short time since the method was first generally used.

While nearly all the probable oil-bearing land in the Wilmington area is under lease, there is still room for considerable development work. In the town lot section and in the Long Beach Harbor area, undrilled locations are numerous. Restrictions against drilling further westward in the Wilmington town lot area are being lifted constantly, opening up a block or so at a time. No systematic spacing according to zones could be attempted during the original boom drill-



PORTION OF LONG BEACH-SIGNAL HILL OIL FIELD

Showing location of De Soto No. 1

This is a full size reproduction of page 30 of the Long Beach-Signal Hill map published in book form by the Homer Dulin Co. of Long Beach. Scale in.=200 ft.

ing, so that it is still possible to find locations where commercial wells in either the Ranger or Terminal zones might be drilled.

The undeveloped reserves in the Tar and Upper Ranger zones have been indicated by the recent completion of several flowing wells on the northwest flank of the field. While the gravity averages 14.0° API, the initial productions were between 450 and 550 barrels per day. Similar production was obtained from Tar-Ranger wells south of Anaheim Street which were drilled at an earlier stage in the development. On the northeast flank, east of the Wilmington fault, only comparatively small Ranger zone wells have been found over a wide-spread area. Economically drilled wells with gravel-packed liners should prove to be profitable pumpers over a large part of that area. In the Long Beach Harbor district, the untested oil sands above the Ranger zone may prove to contain moderate production of heavy oil in the most favorable locations.

The extent of the Ford zone in the western block is probably very much less than that of either the Ranger or Terminal zones, although development has hardly progressed far enough to give much indication. Therefore, aside from the Ford zone, the remaining development work consists of filling in the gaps in the Ranger and Terminal zones, with the possibility of combining Tar and Ranger to good advantage in some portions of the field, and feeling out for the edges of commercial production in nearly every direction.

Acknowledgment is made of the use of material from an article on the "Wilmington Oil Field" by E. J. Bartosh, published in Volume 22, No. 8, Bulletin of the A. A. P. G. in August 1938.

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The Possibilities of Pressure Maintenance

in California Oil Fields

By A. C. Rubel
Director of Production, Union Oil Company of California

(Editor's Note)—The following paper, which was presented at the C.N.G.A. fall meeting by A. C. Rubel, Director of Production for Union Oil Company of California, cites the case for the proponents of Pressure Maintenance. Dr. Stanley C. Herold had previously introduced a hypothetical case for the opponents. This latter paper was presented in second issue of November of the California Oil World. Therein, Dr. Herold analyzed the theoretical effects of returning gas to oil bearing sands, from a standpoint of fluid mechanics. He reasoned that gas input was unsound and unnecessary because water encroachment would eventually deplete the oil sand in any case. After purposely assuming the role of a neophyte, expounding a series of suppositional premises and admitting a series of negative qualifications Dr. Herold concluded with this challenging question—"Would you now as owner of a hypothetical oil field hire me at a high salary to operate your wells under a 'pressure maintenance' program?" Mr. Rubel answers Dr. Herold's questions as follows:

Dr. Herold has propounded a question for your consideration in which he steps entirely out of character by casting himself in the role of a faker and montebank, preying on the credulity of the uninformed hypothetical owner of a still more hypothetical oil field.

Obviously the reply to Dr. Herold's question as propounded is in the negative but that reply is not justified by either the facts which were not presented or by the arguments advanced in support.

Let us look at the statistics in California for the past eighteen years taken from the records of the California Natural Gasoline Association and the Southern California Gas Company. In the period from January, 1920 to August 1938 there has been produced approximately 5568 billion cubic feet of gas of which 1285 billion, or approximately 22 percent, has been blown to the air. At a nominal field sale price of 5c per MCF this represents a dollar and cents loss of $64,252,000.00 or $2868.00 per month to the oil producers of this State.

All other considerations aside, such a record represents waste in its most elementary form, but when it is further considered that in addition to the fuel value represented by 1285 billion cubic feet of gas blown to the air, there is much greater loss in that considerable portion of the total, represented by the energy value of such gas in producing oil from the reservoir. The problem assumes real importance both to the producer and to the processor who must depend on the continued commercial production of oil and gas for the continuation of his business, and to the distributor and consumer as well who are equally affected.

A. C. RUBEL

That gas is the principle propulsive agent in the production of oil in the majority of California fields, during a major proportion of their productive history, is a statement involving no serious argument. That during the past years and to a somewhat lesser degree at present this propulsive force is and has been wantonly wasted by the ruinously competitive system of offset production which forms the basis of our operating philosophy is again a factual rather than an argumentative matter.

That this invaluable and to a major degree irretrievable source of propulsive energy may be conserved and made to serve the producer more efficiently by the simple expedient of gas oil ratio control to the end that the flowing and low cost productive life of a field may be prolonged is likewise a matter of involving but minor differences of opinion among production men.

It will be noted that the statement "may be conserved" is used in the foregoing in place of "can be conserved" and is so used advisedly for under the type of operation which we have developed in the drilling and operation of our fields by our senseless and useless system of competition, which we are pleased to call freedom of action, the operating standard in any competitive field is set not by the performance of the best operations but by the worst.

It should be axiomatic that the best and most economical method of saving both the propulsive and fuel value of gas is not to produce it except as its propulsive energy may be most efficiently utilized, its gasoline content economically extracted and marketed and its subsequent fuel value realized. This is real pressure maintenance which costs little to practice but pays greatly ultimately.

The facts are that avoidably or otherwise there are volumes of natural gas far beyond the ability of the industry to utilize, either as a proper propulsive force in the production of oil from the reservoir or as a fuel for domestic or industrial consumption, being produced from a large number of the fields of the State, that this has gone on for the past 18 years and promises to continue indefinitely in the future.

Our problem then is simply this:

Are we to accept as inevitable this prodigious waste as Dr. Herold would appear to have us do or shall we seek to find means of saving at least a portion of the propulsive or fuel value, or both, of the gas which now is blown beyond recovery.

The processes of so-called "Storage, Repressuring and Pressure Maintenance" are the attempts of the engineers of the industry to meet and in part solve this problem. That such efforts have not been entirely in vain is shown by the record where in the past eleven years approximately 90 billion cubic feet have been utilized in California in one or the other of the above processes, and certainly not without some success.

To properly discuss the terms applied to gas conservation it would be well to define those terms.

Gas Storage is the simple process of pumping gas into an underground reservoir under such conditions that the major portion may be recovered when the demand justifies. It makes no difference whether the reservoir be a gas

reservoir, a depleted or semi-depleted oil reservoir or the gas cap of an oil reservoir, the essential conditions being that the reservoir have sufficient remaining pressure to insure the return of the gas.

To make such a program feasible of course requires a complete and unified control of the structure which presupposes either fee ownership by the operating company or complete unitization by the landowners.

Since the purpose of such a procedure is only gas storage and little or no benefit results to the field or zone in increased oil or natural gasoline recovery, compensation for the use of the reservoir must come from the storing company. This compensation might take the form of an increased price for gas through its sale when demand is greatest. The advantages of such a project are immeasurable particularly if such a reservoir may be strategically located.

The outstanding type of such operations in California is represented by the Buena Vista gas field where through arrangements between the Standard Oil Company and the Southern California Gas Company the reservoir has been used for seasonal storage purposes. Gas storage in the Buena Vista structure in Kern County was initiated in the early part of 1928 and at that time three principal injection wells had a shut in pressure of approximately 120#. The period of injection was followed by a period of withdrawal, the former occuring in summer and the latter in winter. Several of these injection cycles have occurred, and up to September 30, 1938 there has been stored in these three wells a total of 8.4 billion cubic feet of gas and 5.3 billion cubic feet of gas withdrawn, or approximately 63% of the total gas injected in all injection cycles. Operating pressures of the Southern California Gas Company transmission line from Kettleman Hills have permitted injection of the gas from time to time at pressures up to approximately 290#. After a recent limited period of shut in, the wells now show a pressure of 190#. Injection and withdrawal rates approximate 15,000 M.c.f. per day.

Other fields of the State are physically available for storage if ownerships and other conditions were favorable. Examples are the gas zones of Elk Hills, the gas sands of Button Willow and the depleted portions of oil fields where zonal segregations are carefully made such as the First Zone in the Dominguez Field and the Foix Zone at Santa Fe Springs.

Repressuring may be defined as the injection of gas into a semi-depleted oil reservoir for the purpose of stimulating oil production either by increased rate, increased ultimate or both. This process is peculiarly adapted to California fields and particularly those of the Los Angeles Basin where flush production has resulted in the dissipation of large quantities of free and solution gas by the premature release of reservoir pressure.

Repressuring is precluded from consideration in practically every Los Angeles Basin Field under present conditions by the diversity of ownership and the difficulties attending unitization. Repressuring may be conducted in many ways to meet the conditions desired but in every instance complete control of the entire zone involved, or at least such a portion of the zone as to make the loss of injected gas and displaced oil to adjacent properties improbable is a necessary prerequisite of any program.

Repressuring may be carried on in completely shut in and wholly controlled fields such as the Lompoc Field of the Union Oil Company where the process may be considered as both storage and injection, the objective being both to increase oil production and store gas; and Dominguez where the Shell Oil Company and the Union Oil Company conducted a joint program of repressuring in 1927 for the dual purpose of gas storage and increased oil production in the First Zone. In this latter field it was early recognized that very careful regulation of producing wells was necessary to control the gas movement within a given property and that with the increase in pressure due to increased volumes of injected gas it became impossible to confine gas, and probably oil, movement within properties and the project was abandoned. Approximately 12 billion cubic feet was injected during the project. A relatively small proportion of this could be considered as stored gas, the balance being in effect recycled through the formation.

The project had little commercial importance but it definitely demonstrated three very important facts, which have been closely checked since, of great value to both the producing and gas industry. These are:

1. That it is possible to vary within rather wide limits the rate of production of a zone by using injected gas as a displacement medium, even within the restricted area of a lease boundary;

2. That with unitized operation and a carefully controlled injection a very complete control of production rate may be obtained;

3. And, again with unit operations, a combined program of gas storage and production control can be effected, regulated to meet the seasonal demands which would be of great value to the operator, the lessor and the gas industry in the increased availability of gas for sale and the controlled production of oil.

Here I am sure my good friend, Dr. Herold, will take violent issue with me and say that the natural encroachment of edgewater and the consequent displacement of oil will insure complete recovery and that stored gas cannot increase that recovery and may even hinder it. I am inclined to agree with his analysis if he will eliminate the factor of time from consideration. In many fields edgewater does not encroach rapidly and it is in these fields that I claim that rates of oil recovery may be substantially increased and controlled which is equivalent to an increase in ultimate and that gas may be held in storage at the same time against seasonal withdrawals.

Here I must emphasize a fact almost entirely overlooked in academic discussions of repressuring, that while an increased rate of production during the declining life of a well may not result in any increase in the theoretical ultimate, it may result in an increase in the economic ultimate.

We as producers are not interested in the fact that natural forces of edgewater will in time probably recover all of the oil and gas physically available in the reservoir, but we are interested in the fact that unless recovery is at commercial rate, the well must be abandoned and subsequent production lost.

Pressure Maintenance is a practice new to California except perhaps in the early experiments of the Continental Oil Company at Seal Beach. It differs from Repressuring only in that the return of gas is started early in the field's productive life and continued, the plan being to return the produced gas to the reservoir to restore in a measure the volumetric depletion of production and thus maintain a high reservoir pressure even though large volumes of oil are withdrawn.

It is true, as Dr. Herold points out, that the returned gas will migrate to the high points of the structure and form a gas cap which will progressively extend down dip and progressively "capture" wells which originally produced oil but, in many cases and particularly in high pressure areas this condition develops naturally without injection as shown in Kettleman Hills and North Belridge. If this tendency can be controlled a "Squeeze" may be set up between the expanding gas cap and the encroaching edgewater which will effectively deplete the reservoir of oil and still leave as a remaining and recoverable asset the "gas cap" itself.

The economics of this procedure in California is yet to be determined and

(Continued on Page 18)

A. P. I. 1938 Annual Meet Refining Abstracts

Corrosion Protection of Refinery Equipment. J. A. Jamison. Abstract: Corrosion problems in refinery equipment and methods of protection are presented as the result of a field survey. Numerous examples are included to show the specific effect of commonly-used remedial measures. A general discussion deals with corrosion of condensers, exchangers, furnace tubes, and towers in crude-distillation, cracking, viscosity-breaking, gasoline recovery, and cracked-distillate re-run units. The appendix contains a summary of data collected on cracking-plant corrosion rates and remedial measures, together with sundry other detailed case histories of corrosion problems based on crudes from the Mid-Continent district, Michigan, West Texas, and California.

EARLE W. GARD

Earle W. Gard, of Union Oil Co. of California, Los Angeles, Calif., is chairman of the Sub-committee on Valves (of the Committee on Standardization of Refinery Equipment) which convened during the Nineteenth Annual Meeting of the American Petroleum Institute in the Stevens Hotel at Chicago, Ill., November 14 to 18, 1938.

Mr. Gard was born in New Burlington, Ohio. He was educated in the Xenia Grammar and Dayton High Schools; attended Dayton University; and was graduated by University of Southern California.

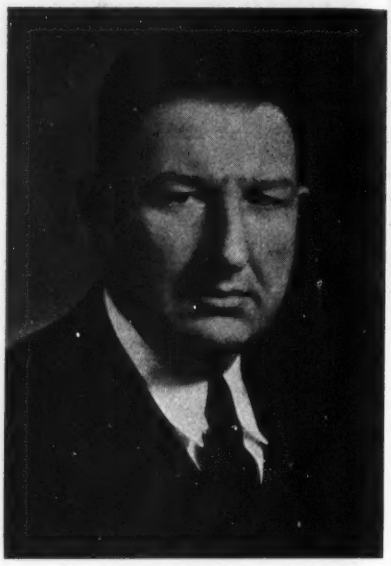
During the World War, he served for two years in the U. S. Navy. Employed by Union Oil Co. of California in 1919, he remained in the testing and development department until 1923 when he resigned to become assistant manager of Pan American Oil Company's refinery at Watson, Calif. In 1928, he returned to Union as assistant to R. E. Haylett, then manager of research and development, and in 1930 was appointed development engineer. Currently, he is director of research and development, responsible for the affairs of the research, development, and patent departments.

Mr. Gard has been consistently engaged in the engineering and scientific advancement of refining practice.

Continuous Coking of Residuum by the Delayed Coking Process. R. J. Diwoky. Abstract: Plant application of the continuous "delayed coking" process is described. This process, which offers many advantages over earlier batch-still methods, is accomplished by passage of the charging stock through a furnace into one of several vertical drums in which coking takes place. Coke removal is effected by cable pulling.

Control of Wax-Distillate Quality, E. A. Burch. Abstract: The laboratory and pilot-plant methods of controlling the quality of wax distillates developed and used by Continental Oil Company and a survey of five Oklahoma wax distillates by the Chemical Engineering Department of the University of Oklahoma are given in four sections: I. The analytical separation of wax-oil mixtures is discussed, and methods presented for the selection of the correct solvents and for the determination of the theoretical yield of wax of any desired melting point from a given slack wax. II. A pilot sweating plant is described, and the various factors affecting the yields of scale wax from the sweating operation are discused. III. A modified vacuum-distillation apparatus is described, and the use of the apparatus for the examination of wax distillate discussed. The relationship between viscosity and mid-distilling temperature is recommended as a basis for the estimation of pale oil yields. IV. The analytical methods described and the University of Oklahoma pilot-plant equipment are used to study the characteristics of five Oklahoma wax distillates. The results show a great difference in quality, based both on possible pale oil and on wax yields.

The Determination of Yield Per Pass, Time of Treatment, and In Situ Density, and Instrumentality for Their Control in Commercial Cracking Units, Robert L. Rude, Raymond D. Junkins, and Colin Barnes. Abstract: The time of treatment in cracking is determined from measurements of density in situ of the fluid in the conversion section. The density is determined from the known weight rate of furnace charge and the differential head developed at adjustable orifices installed in the path of flow. Tests conducted on commercial cracking units have provided data permitting the empirical correlation of time, temperature, stock characteristics, and yield per pass. On the basis of this correlation, instruments have been developed for the continuous control of the cracking operation. The tests showed further that the density at the outlet of the conversion section is an index of the total heat in the synthetic crude, and that this heat can be varied over wide limits while maintaining a desired yield per pass.



H. J. WILSON

H. J. Wilson, of Tide Water Associated Oil Co., Associated Division, San Francisco, Calif., served as construction engineer with Shell Oil Co., at Martinez, Calif., from 1914-16, and with Stone & Webster Engineering Corp., at Boston, Mass., from 1916-18. He returned to the Shell organization for one year. Employed by Associated Oil Co., in 1919, he did civil engineering and construction engineering work until 1925. Since then he has been superintendent of fire protection and safety, retaining that position when Associated Oil Co., merged with Tide Water Oil Co. His business experience includes oil refinery and sales facility construction, power plant, steel mill, and general building construction. Mr. Wilson has been active for many years in the A.P.I. committee work.

Catalytic Processing of Petroleum Hydrocarbons by the Houdry Process, Eugene Houdry, Wilbur F. Burt, A. E. Pew, Jr., and W. A. Peters, Jr. Abstract: The paper indicates the present commercial status of the Houdry catalytic processes for petroleum-hydrocarbon refining. These processes involve complete catalytic operations for pro-

duction of high-octane motor fuels and aviation gasolines by cracking of gas oils, residuums, and crude oils with or without fuel-oil production. Included

D. L. CALDWELL

D. L. Caldwell, of Barnsdall Oil Co., was graduated by Stanford University in 1920. From 1920 to 1928, he served jointly with Pacific Oil Co., and Associated Oil Co., as petroleum engineer in various California fields. During the year 1922-23, he was in Alaska on the test of the Pearl Creek structure at Kanatak. Employed by Barnsdall Oil Co., in 1927, Mr. Caldwell, currently, is production engineer in California operations. Active in Institute activities for many years, he is chairman of the Production Practice Committee, California District.

also are brief discriptions of catalytic liquid-phase viscosity reduction of tars, polymerization of butenes, vapor-phase and liquid-phase catalytic treatment of gasoline and aviation fuels, and de-sulfulization of gases by catalytic action. Yields and qualities of products are given. Types of catalysts used and methods of operation are described in general terms. Effects from standpoint of conservation and economies are discussed.

The Use of Rust-Hole Records to Study Pipe Service, Walter F. Rogers. Abstract: It has been found that a relationship exists for pipe lines between the cumulative number of rust holes and time. The relation is expressed by the exponential equation $R=bT^n$. Pipe lines of short length may have two or more values of n during the first 10 to 15 years of their history. The longer the pipe line, the fewer are the values of n. The value of reconditioning to a pipe line may be determined by plotting the relation of cumulative rust holes vs. time for the line. It has shown for the pipe lines studied that "hot-spot" reconditioning is more economical than "long-line" reconditioning. The cumulative rust-hole-vs.-time curves for 6-in. and 8-in. pipe with a minimum age of 15 years is used to calculate the value of pipe-wall thickness in governing the occurrence of rust holes. The data show that pipe weight should be governed entirely by the pressure to be used, and no wall thickness should be added for soil-corrosion attack. Soil-corrosion best can be taken care of by pipe coating and cathodic protection.

The Anti-Knock and Mixture-Distribution Problem in the Multi-cylinder Engine, A. J. Blackwood, O. G. Lewis, and C. B. Kass. Abstract: Past surveys by the Institute indicated the probability that significant reduction in the average anti-knock requirements of cars might be effected without making any major changes in the engine. This paper describes extensive studies of ignition-system characteristics and gasoline-mixture distribution as affecting detonation. The results have brought out the following pertinent points: 1. Variations actually occurring in the spark advance from cylinder to cylinder may vary the octane-number requirement by about 10 points. 2. Even with perfectly synchronized spark advance to all cylinders, the variation in mixture strength reaching individual cylinders during full-throttle operation may cause a variation of about 15 points in octane-number requirements. 3. With the particular test engine used, mixture distribution could be improved markedly only by going to excessively high fuel volatility. 4. Apparently, present-day cars are not capitalizing on the continued efforts of the petroleum industry to provide fuels of better volatility and higher octane number. 5 Care in assembling present-day cars at the factory could bring about an average decrease in octane-number requirement of several points. This, in turn, could be utilized in future designs to permit of higher compression ratio and increased efficiency.

Study of the Recovery of Oil from Spent Percolation Filters, C. M. Ridgway, L. M. Henderson, and W. B. Ross. Abstract: A study was made of one of the important factors influencing percolation costs, viz., the recovery of the oil remaining in the filter when the adsorbent is spent. In the process of this investigation the factors involved in the two operations of filter draining and filter washing were studied. The following general observations and conclusions were drawn from the data obtained. 1. In plant filters the rate of draining and the total amount drained are dependent primarily upon the condition of the screen. 2. In naphtha washing a low uniform washing rate is desirable. 3. The first

MILAN G. ARTHUR

Milan G. Arthur, of Standard Oil Co. of California, La Mirada, Calif., was graduated by the College of Mining, University of California, class of 1937. Currently, he is junior petroleum engineer in the production department of Standard Oil Co. of California, with headquarters at La Mirada. Mr. Arthur is a junior member of the A.I.M.E., and member of Tau Beta Pi, honorary engineering society, and Theta Tau, engineering fraternity.

portion of the washing naphtha should be applied at a temperature below that of the filter, and in such volume as is necessary to remove the filterable oil. The subsequent washing naphtha should be added at a temperature above that of the filter for the purpose of dissolving an increased proportion of the tar. 4. A paraffinic naphtha of low vapor pressure and low end point should be used in washing. 5. An appreciable increase in the viscosity of the original charge increases the amount of naphtha necessary to reduce the oil content of the filter to a specific magnitude. 6. The color of the cylinder stock recovered in the clay-wash is not indicative of its filterability. 7. The filterability of the oil contained in the washings is at present the only criterion that can be used in judging the fraction to be returned to the blend tank for re-processing. 8. Clay-wash cylinder stock should not be blended with stocks of better filterability, inasmuch as this material decreases the filter yields to a much greater extent than its arithmetical proportion. 9. When re-cycle wash is used, extreme care must be taken to avoid introducing into the system material of poor filterability.

(Continued from Page 15)

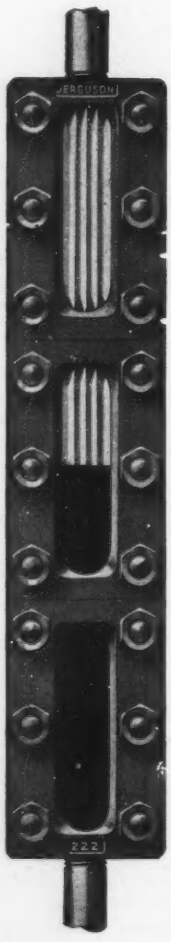
must depend to a large measure on a comparison of production policies. One requires immediate high yields with initially low cost and rapid payout leaving subsequent recovery in the nature of salvage, while another requires relatively low initial yields with slower payouts but a sustained and in a measure controlled yield of both oil and gas over a long period of time. Such matters as injection pressures and rates with their attendant costs as compared to possible savings are, of course, matters for the engineer and operator to decide.

In my opinion, Gas Storage, Repressuring and to a more limited extent Pressure Maintenance is feasible, practical and essential practices thoroughly adaptable to California fields. None of these processes can be adapted on any substantial scale, however, until the present barriers have been removed and operators and landowners are willing to forego the immediate and in many instances dearly bought returns in favor of a long time program resulting in greater ultimate profits.

Let us hope it may be accomplished before it is too late.

JERGUSON

REFLEX GAGES



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R. M. Morrison Succeeds As Nineteeners General

The Nineteeners held their 63rd monthly meeting at Hacienda, with Percy Hayes acting as host, on Dec. 15. This enthusiastic group, which is composed chiefly of men connected with the oil business, is enjoying the democratic reign of General Richard M. Morrison of The Texas Co., their new Big Shot who succeeds Hitler Holly Hayter of the Tidewater-Associated Oil Co., whose term as dictator has expired. Al Jensen, of Western Pipe and Steel Co., is the present Club Champion, and Lev Sacre, of Timken Steel Co., is holder of the Jensen Cup—won at the last annual pari-mutuel event held at Rancho Santa Fe a few months ago.

California Crude Oil Production

Two Weeks Ended December 10, 1938

	December Daily Quota	Average Daily Production	Excess
San Joaquin Valley			
Belridge—North	14,985	12,662	*2,323
Belridge—South	1,875	1,035	*840
Buena Vista	16,935	17,325	390
Canal	3,830	3,872	42
Coalinga-East (Eocene)	2,024	1,985	*39
Coalinga—East-West	15,851	6,496	*9,355
Coffee Canyon	2,870	3,030	160
Edison	2,485	2,532	47
Elk Hills	7,750	10,229	2,479
Fruitvale	7,050	8,585	1,535
Greeley	2,665	1,796	*869
Kern Front	7,830	7,527	*303
Kern River	5,585	2,492	*3,093
Kettleman No. Dome	58,450	58,894	444
Lost Hills	4,230	3,164	*1,066
McKittrick	3,865	3,286	*579
Midway	42,335	27,399	*14,936
Mount Poso	13,605	13,672	67
Mountain View	8,605	9,653	1,048
Rio Bravo	6,710	10,417	3,707
Round Mountain	9,265	10,358	1,093
Ten Section	8,705	8,853	148
Wasco	651	396	*255
Other Fields	2,539	2,325	*214
TOTAL	250,695	227,983	*22,712
Coastal Counties			
Elwood	4,790	5,008	218
Rincon	2,990	3,853	863
Santa Maria	5,965	3,470	*2,495
Gato Ridge	2,325	3,383	1,058
Santa Maria Valley	19,365	10,087	*9,278
Santa Paula-Newhall	4,950	5,506	556
Ventura Avenue	31,145	34,279	3,134
Other Fields	5,765	6,217	452
TOTAL	77,295	71,803	*5,492
Los Angeles Basin			
Alamitos-Seal Beach	7,405	7,903	498
Brea-Olinda	8,305	5,791	*2,514
Coyote—East	2,800	3,340	540
Coyote—West	7,910	8,011	101
Domingues	19,940	26,836	6,896
El Segundo	4,170	6,063	1,893
Huntington Beach—New and Old	25,700	30,768	5,068
Inglewood	13,110	12,600	*510
Long Beach	42,845	54,114	11,269
Montebello	6,159	6,100	*59
Montebello-West End	4,451	11,183	6,732
Playa del Rey	5,070	5,506	436
Richfield	7,650	8,235	585
Rosecrans-Athens	8,915	14,782	5,867
Santa Fe Springs	28,180	30,258	2,078
Torrance	15,485	18,765	3,280
Wilmington	69,905	97,013	27,108
Other Fields	2,980	3,099	119
TOTAL	280,980	350,367	69,387
STATE TOTAL	608,970	650,153	41,183

*—Shortage.

Allocation of production to the states by a Federal oil umpire is the only thing that can save the oil industry from chaos, in the opinion of Governor E. W. Marland of Oklahoma.

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12-38

De Soto Discovers Long Beach Deep Zone

Well Flows on Gas Lift From 10,157 ft.

Climaxing one of the most notable years in the annals of California oil industry. De Soto Oil Co. finished its No. 1 well in the Long Beach field as the discoverer of a new and deeper zone. Without minimizing the amazing developments in the San Joaquin Valley, it is safe to say that no single well, with the possible exception of General Petroleum's Wilmington discovery well, has been so vital to the business as a whole since Shell's Alamitos No. 1 started the first Signal Hill boom seventeen and a half years ago.

Behind every prospect well lies a human interest story. In 1921, two young geologists, Jasper Paulson and Dwight Thornburg, who, while under only general orders from the Shell Oil Co. of Calif., studied and mapped Signal Hill. This accomplished, they leased sufficient acreage to justify a test and then talked the company into drilling Alamitos No. 1.

The Saga of 1938 is, perhaps, even more intriguing. It starts with one R. W. Jerman, known to all and sundry within the oil fraternity as "Rock" or "Rocky". One year ago Mr. Jerman, had he viewed himself objectively, could have summed up his assets in this manner: a few scattered oil interests, a few debts, the experience gained from drilling 17 oil wells, a fine personality, an immense amount of what is politely known as intestinal fortitude, and a burning idea. The idea itself was simple enough and Rocky himself would be the last to claim originality for it. In short, it was that in all probability a super deep zone existed in the Long Beach field.

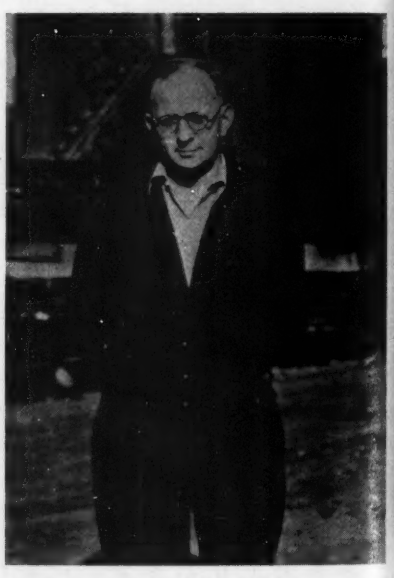
For several years this had been an occasional topic of conversation among oil men and always it had been side-tracked, and for very good reasons. A few of them were: drilling in the field is much more expensive than in other Basin fields because of the hardness of the shales; the major companies preferred to consider a possible deep zone in the light of future reserves and looked with open disfavor on the prospect of being forced into an offset drilling campaign during a period of near overproduction; leases, with but few exceptions, are small and anyone spending a sizeable fortune to drill a deep test would be doing his neighbors a bigger favor than himself To risk a possible expenditure of $175,000 in the face of such conditions was more than any operator wanted to do at a time when wells were being completed at 5000 ft. in Torrance at an average cost of less than $35,000.

The gentleman of our story, however, carefully analyzed the situation and came to rather definite conclusions. First, it was obvious that no major company support could be obtained. Second, no independent company could be depended upon to fully finance such a test. The third step was logical enough. A deep test undoubtedly would benefit every small company on the Hill, why, therefore, would not they buy percents in such a project to prove their own holdings? Given the opportunity by Mr. Jerman, many of them did, as well as far sighted supplyhouse men and individuals holding properties near the proposed well site.

After months of hard work in organization, the De Soto Oil Co., R. W. Jerman, president, spudded in De Soto No. 1 on June 8, 1938 on Gundry Ave., just south of the famous Hass lease, often termed the "World's Richest 10 Acres". Some years ago, Gundry was not Gundry but Lovelady, and the new well is located in the heart of what always will

R. W. (Rocky) Jerman, President and Instigator. E. J. (Ed) Kasey, Superintendent

Mrs. Jerman who attended the world's premier of the well.



Paul Gates—"The Keeper of the Keys" to the core house.

Dependability . . .

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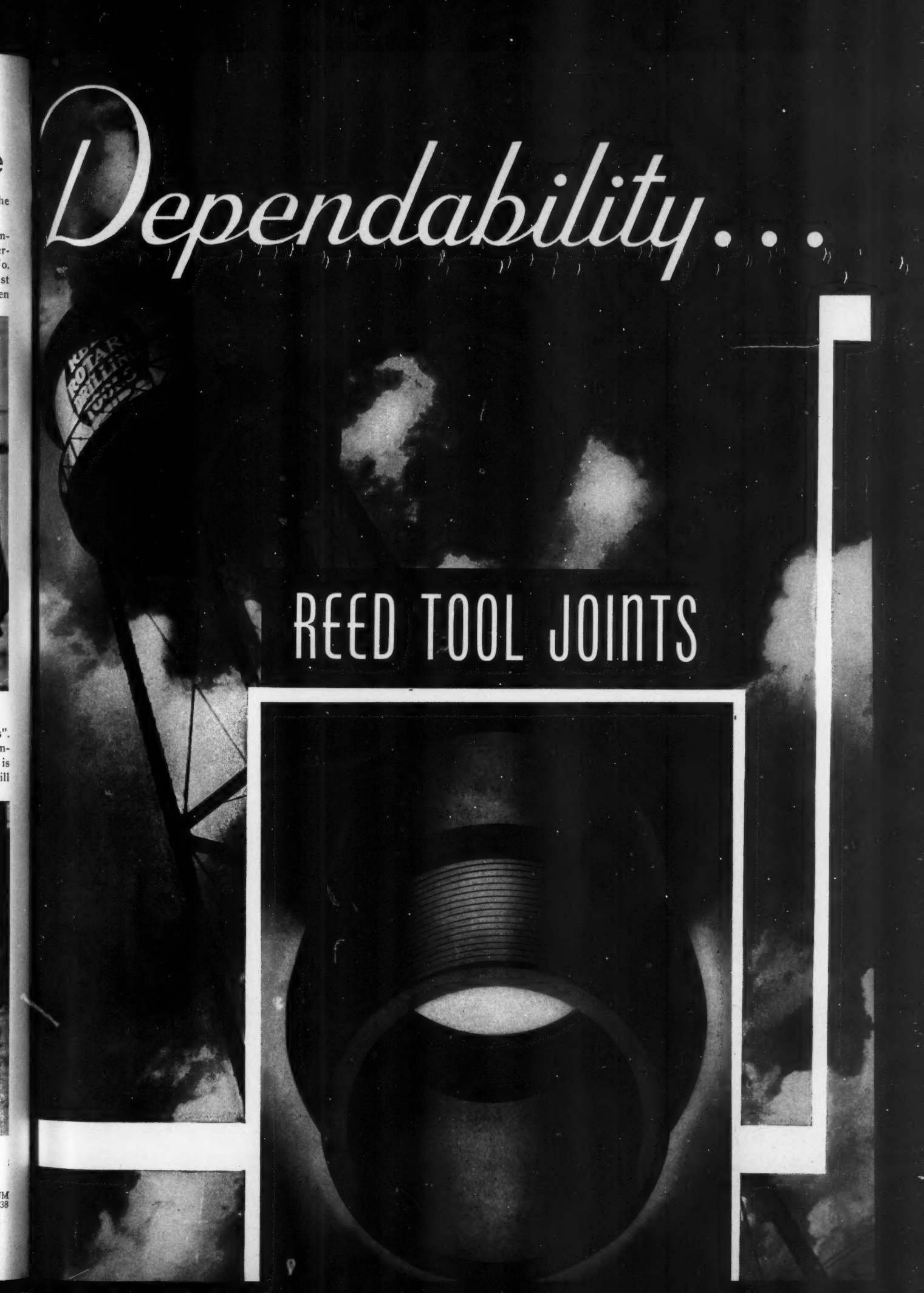


be called the Lovelady Pool regardless of the whims of street name changers. Drilling progressed uneventfully enough at first and at 4252 ft. was cemented what is perhaps a record string of 13⅜-in. welded casing. First gray hairs came to Superintendent Ed Kasey's head when a fishing job looked bad for a time at 7225 ft. A few days later the crop increased ten fold when a fish had to be sidetracked at 7525 ft. Without further serious incident, drilling continued to 9926 ft. when it was decided a test should be made of oil sands cored below 9760 ft. Accordingly, 7-in. casing was cemented at the latter point, new hole made to 9981 ft. and a formation tester run which recovered 62 stands of clean oil. With this assurance of success, coring was continued to final depth of 10,157 ft.; a zone penetration of 400 ft. of which 260 ft. were indicated as oil sand on the electric log.

During the week following the landing of a perforated liner on bottom, everything possible occurred to try the soul of an oil man. Destiny, it seemed, had aligned all her forces against the De Soto Oil Co., but at times when most humans would have thrown the derrick hatchet at the nearest bystander or at least have chewed up a hard hat, Rocky Jerman and Ed Kasey were the most cheerful men on the rig.

Surmounting all difficulties, the well was finally completed flowing by gas lift on Dec. 13 the production gauging 300 bbls. of clean 29 gravity oil.

The De Soto well today is a commercial producer; large enough to pay out, and small enough to discourage a large amount of new drilling.

Aliso Canyon Discovery

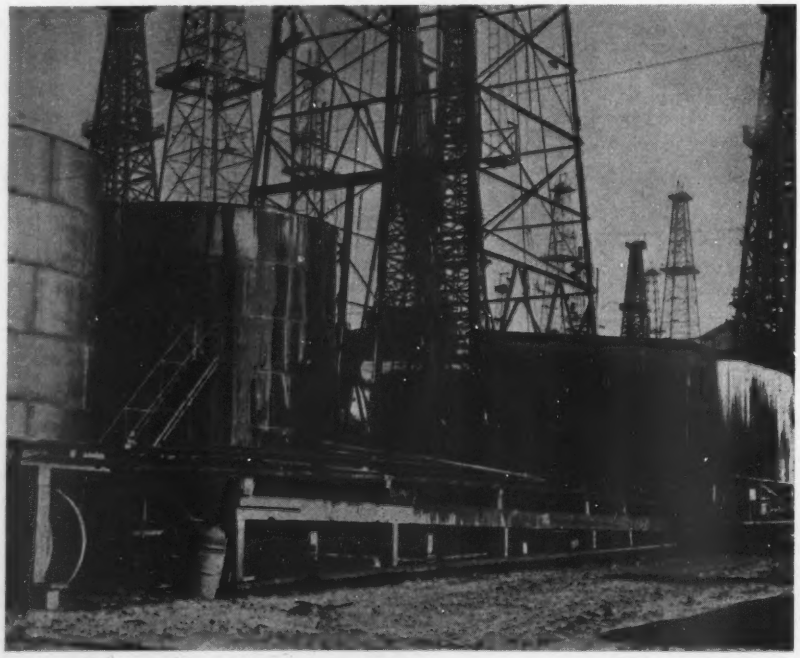
The new Aliso Canyon oil field, discovered by the Tide Water Associated Oil Co. on October 25, 1938, is located on the south front of the Santa Susana Mountains, some six and one-half miles northwest of San Fernando and six miles northeast of Chatsworth.

The discovery well, Porter No. 1 is located in the SE quarter of the SE quarter of the NW quarter of Section 27, Township 3 North, Range 16 West, S.B.B.&M.

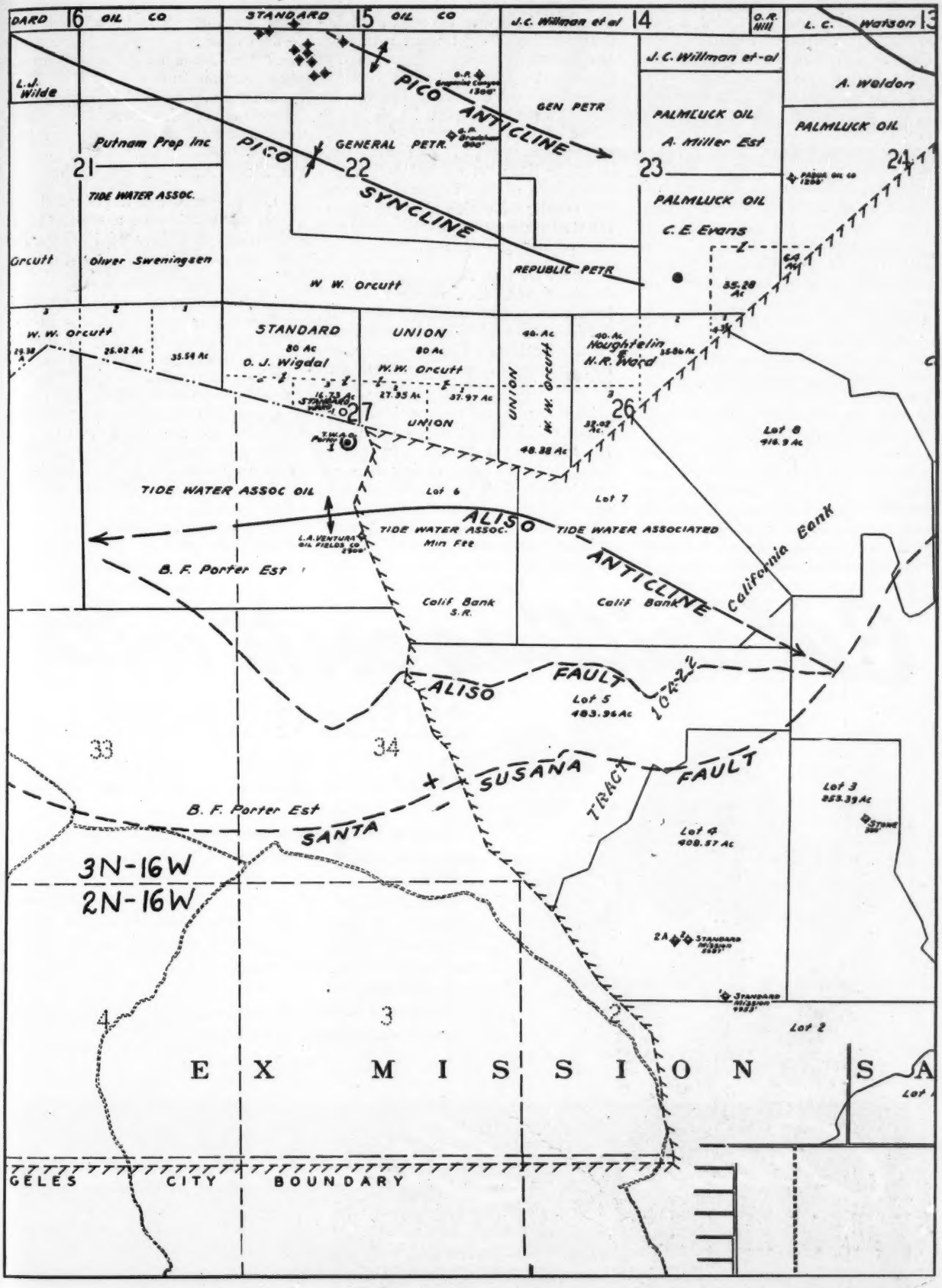
The Santa Susana Mountains, in the vicinity of the Aliso Canyon oil field, rise from the floor of the San Fernando Valley to an elevation of 3000 to 3500 feet, in contrast to 600 to 700 feet elevation in the Valley. The topography in this portion of the Santa Susana Mountains is very rugged, with differences in elevation ranging up to 1000 feet. Deep canyons and steep slopes are common, requiring extensive road building and grading. In order to reach the location selected for the discovery well, it was necessary to build approximately four and one-half miles of mountainous roads, along which numerous deep cuts and fills were necessary.

The geological work was done by C. E. Leach and J. C. May, under the supervision of L. C. Decius and F. A. Menken.

The location for Porter Well No. 1 was made in order to test the Aliso Anticline, a dome-like fold in Miocene rocks on the upthrown side of the prominent Santa Susana Fault. The Aliso Anticline trends in an east-west direction, the axis of which is approximately 1300 feet south of the discovery well. The axis can be traced for a distance of about four miles. The south flank



At left is the oil splashed De Soto. Above, the crew is putting the well on gas lift.


DARD 16 OIL CO
STANDARD 15 OIL CO
J.C. Willman et al 14
O.R. Hill
L. C. Watson 13
L.J. Wilde
PICO ANTICLINE
PICO SYNCLINE
GEN PETR
J. C. Willman et-al
A. Waldon
PALMLUCK OIL
A. Miller Est
Putnam Prop Inc
GENERAL PETR.
21
22
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24
TIDE WATER ASSOC.
PALMLUCK OIL
C. E. Evans
Orcutt
Oliver Sweningsen
W W. Orcutt
REPUBLIC PETR
35.28 Ac
W. W. Orcutt
STANDARD
80 Ac
O. J. Wigdal
UNION
80 Ac
W. W. Orcutt
40. Ac
UNION
W. W. Orcutt
40. Ac
Noughtelin & H.R. Word
27
26
UNION
48.38 Ac
Lot 8
916.9 Ac
TIDE WATER ASSOC OIL
Lot 6
Lot 7
ALISO
TIDE WATER ASSOC.
Min Fee
TIDE WATER ASSOCIATED
ANTICLINE
California Bank
B. F. Porter Est
Calif Bank
S.R.
Calif Bank
ALISO FAULT
Lot 5
483.96 Ac
33
34
SUSANA
FAULT
TRACT
B. F. Porter Est
SANTA
Lot 3
853.39 Ac
Lot 4
408.57 Ac
3N-16W
2N-16W
4
3
2
Lot 2
E X M I S S I O N
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of the anticline is complicated by the Santa Susana fault and a subsidiary fault referred to as the Aliso Fault. The dips on this flank are steep and in some instances overturned. In contrast, the north flank shows an average dip of 35° to 40° and extends for approximately two miles to the Pico Syncline, which separates the Aliso Anticline and the Pico Anticline, along which are found such fields as the Pico Canyon, DeWitt Canyon, Towsley Canyon and Wiley Canyon. The surface beds are Miocene in age, equivalent to the Lower Monterey. In the core of the anticline, beds of Topango age are exposed.

The discovery well, Porter No. 1, was located on the north flank of the Aliso Anticline in order to test the Lower Miocene and those beds underlying the Santa Susana Fault. The well was spudded on June 21, 1938 and on June 23, 18⅝" casing was cemented at 210 feet and on July 18, 1938, 13⅜" casing was cemented at 1699 feet as a protection string. At a depth of 1772 feet the well entered the Topango Shale, which formation continued to a depth of 1895 feet, where the Santa Susana Fault was encountered, below which the well went into beds equivalent to Marine Saugus, or Upper Pico. Almost continuous oil showings were found below the fault and on August 21, when a depth of 3799 feet was reached, 9⅝" casing was set at 3627 feet. With drillable liner set on bottom, a test was made of the 171 feet of zone, the results of which showed an estimated production of 25 barrels per day of 29° gravity oil.

The well was then deepened to a depth of 4225 feet, where a second test was made on September 13, 1938, with drillable liner landed on the bottom. The results of this test indicated a daily production of 100 barrels of 21° gravity oil.

The well was then drilled to a depth of 5393 feet and on October 16, 1938 the well was plugged to 5365 feet and 6⅝" casing was cemented at 4795 feet. 564 feet of 4½" drillable liner, all perforated 80 mesh, was hung at 5359 feet. 3" tubing was landed at 4658 feet and on October 25 the well was swabbed to 1200 feet, when the well began flowing. The initial flow rate was estimated at 1000 barrels per day. On October 26 the well flowed 914 barrels in 24 hours of 23.7° gravity oil, cutting 2.1% through a 29-64" bean, with a tubing pressure of 140 pounds and casing pressure of 595 pounds. Gas was estimated at 215 M.C.F.

On November 1 a potential test was made through a 40-64" bean, resulting in a flow of 1200 barrels per day of 23.9° gravity oil, cutting .7%.

The zone from which the well is producing is believed to be Middle Pico in age. The sands in this interval were medium to coarse grained and pebbly. Laboratory analysis of the sands indicated a porosity of 35.6%, with a permeability parallel to the bedding plane of 2030 millidarcys and 1960 millidarcys perpendicular to the bedding.

Most of the acreage in this new field is held by Tide Water Associated Oil Co., which has under lease 1170 acres and owns in fee 234 acres adjacent to the well.

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Field Development

Los Angeles Basin

4th Finger Best Zone In West Montebello Field

The Fourth Finger of the Sixth zone continues to prove itself the best horizon yet developed in the western section of the Montebello field. Completions from this interval have been consistently good and the decline of producing wells has been less abrupt than in the shallower zones.

Little is yet known of the potentialities of the Seventh zone but engineers predict that in good locations, it will probably surpass the Fourth Finger in productivity.

Latest completion in the field was Pongratz Petroleum Co., Martin No. 1. Hole was bottomed at 6700 ft. and the well swabbed in flowing 1487 bbls. a day, clean. Preparing to complete are St. Helens Petroleum Co. Monterey No. 28, Brookline Oil Co., Drake Comm. No. 1, Montebello Wesco, Inc. No. 1 and West Montebello Oil Co. No. 1.

All producing wells in the area are being beaned back in conformance with the new proration agreement which has been signed by all operators.

The field is now at its most active point, there being sixteen wells, besides those above mentioned, drilling or preparing to drill.

Basin Oil Potrero 2 Production Increased

Basin Oil Co., which has batted 1000 in the Potrero field, recently increased production in its second country club well by gun perforating at the 5850 ft. level. The output dropped from the 600 bbl. initial to around 300 bbls. from a small interval at 6000 ft. but, with 50 ft. opened at the higher point, returned to 550 bbls. flowing through a 22/64 in. bean. Gravity of the oil, which is clean, is better than 43. A third well is being spudded.

The success of Basin Oil Co. is bringing this long dormant field again into the limelight and a new period of activity is confidently predicted. Immediately after the first production was obtained by Associated Oil Co. ten years ago, a typical townlot drilling boom ensued which ended almost as disastrously as the famous Lawndale fiasco. Here, oil sand cores look the same as water sand and as faulting makes correlations unreliable, core analysis must be resorted to; a thing unheard of until recent years.

Texas Tops Schist In Torrance Extension

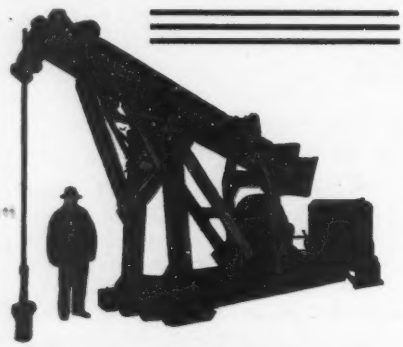
The Texas Co.'s Oakley No. 2, located west of Figueroa St. near "Q" St., was the third Torrance Extension well to encounter the basement when it found schist fragments immediately below the nodular shale at 6035 ft. Previously, D. & B. Oil Co., at 255th and Petroleum, and R. R. Bush Oil Co. at a point 1350 ft. north of Lomita Blvd. on Frampton had found the same formation. Respective depths were 6300 ft. and 5940 ft.

LOS ANGELES BASIN WILDCATS

Area	Well	No.	Section	Depth	Status
Athens	Entrikin, W. E.	1	7, 3-13	5875	Drilling
Bellflower	Clayton, Geo. L., Scott	1	32, 3-12	6897	Idle
Castaic	Royal Land Corp.	1	8, 4-17	1325	Drilling
Dominguez	Richfield Oil Corp.	1	2, 4-13	6990	Drilling
La Mirada	DHB Oil Co., Heath	1	34, 3-11	6150	Idle
	John McKeon and Assoc. Carmenita	1	21, 3-11	8956	Testing
Mojave	Mojave Pet. Co., Gorman	1	5, 8-18	450	Drilling
	Jennings	2	33, 5-14	260	Drilling
Newhall	Continental Oil Co., Newhall	1	20, 4-17	2400	Drilling
	Mangrum and Page, Lintz	1	4, 3-15	150	Drilling
	Newhall Drlg. Asso., Needham	4	13, 3-16	3505	Cleaning out
	Palmluck Oil Co.	1	23, 3-16		Rig
Palmdale	Neu-Cal	1	17, 6-12	1100	Drilling
Palos Verdes	Gene McLaren	1	27, 4-14	3992	Idle
	Rolling Hills Pet.	1	27, 4-14	5100	Cleaning out
Santa Monica	The Texas Co., A-S	1	9, 2-15	7285	Plugging
San Pedro	Grady, R. T.	1	23, 5-14	580	Drilling
	Hogan Pet. Co., Burkhard	2	6, 5-13	3734	Abandoned
Whittier	Langstaff, Geo. W., Iliff	1	8, 2-11	2250	Idle
	H. C. Oil Co., Joyce	1	22, 2-11		Rigging up
	Orange County				
Anaheim	The Texas Co.	A-13-1	8, 4-10		Rigging up
Bolsa Chica	New Fields Oil Co.	1	16, 5-11	4100	Idle
Corona del Mar	Shell Oil Co., Irvine	1	6, 7-9	2500	Drilling
Costa Mesa	A. V. Oil & Gas Co.	1	16, 6-10	4751	Idle
	San Bernardino				
Carbon Canyon	Carbon Canyon Oil Co.	1	30, 2-8		Rig
Chino	So. Counties Pet. & Drlg. Co.	1	26, 2-8	2800	Drilling
	San Diego County				
Carlsbad	Dauphin Dev. Co., Kelly	1	16, 12-4	820	Fishing

Several years ago Superior Oil Co. encountered schist fragments at 5500 ft. in its deep test on the Torrance lease. Solid schist was picked up in the Texas well at 6103 ft. and final bottom is 6190 ft. Hole is being plugged to complete in the D & B zone.

Only four wells have been completed in the extension area, the best being R. R. Bush Oil Co.'s Torino No. 1, deep test which was plugged back to 5224 ft. and finished with the surprisingly good flow of 350 bbls. Completions by D. & B. Oil Co., A. N. Macrate, and General Petroleum Corp. ranged from 65 to 250 bbls.



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Five Point Production Doubled by J. E. F. Bruce 1

Nearly doubling the production of the small Huntington Beach Five Points field, J. E. F. Oil Co. finished Bruce No. 1 pumping 190 bbls, of 17.5 gravity clean oil. Hole was bottomed at 4425 ft. and 65 ft. of oil sand is in use. Reid Petroleum Co., headed by E. C. (Gene) Reid, and John W. Booth expect to start new wells in attempts to extend the field.

Largest Well Completed In Torrance Area

With an initial flow estimated between 500 and 1000 bbls., Felix Mallon completed his second Torrance well as the largest producer in the Eshelman area of the field. A week after, the yield had steadied to 585 bbls. of 27 gravity clean oil through a 34/64 in. bean under 100 lbs. flow pressure. The well, located in the north side of 237th St., 350 ft. east of Eshelman Ave., was bottomed at 5150 ft. and was completed with 7-in. casing cemented at 4924 ft. 260 ft. of 5-in. liner including 245 ft. of perforated was landed on bottom. The effect on Torrance operators is reflected in the many new projects already under way in the immediate vicinity.

Other good completions in the Eshelman Sector were Plymouth Oil Co. No. 1 pumping in excess of 200 bbls.; A. & T. Oil Co. No. 2, 220 bbls.; Alford Oil Co. No. 11, 160 bbls. and Woolner Oil Co., 175 bbls.

Just west of the former "Hot Spot", Standard Oil Co. brought in Marble No. 2-11 flowing 285 bbls. cutting 5 per cent. Pacific Western Oil Co. is preparing to deepen Marble Fee No. 11.

Bids Asked by City For New Harbor Wells

After hurdling the last legal obstacle, the City of Long Beach has at last issued a call for bids to develop the municipally owned tideland strip running from the flood control channel on the east to the city boundary on Terminal Island to the west. The strip has been divided into four parcels and bids may be submitted on any or all parts. Eventually, it is expected more than a hundred wells will be drilled.

Most interesting well lately drilled in the Wilmington field is Allied Petroleum Corp.'s No. 30, located near the municipal gas holder south of Anaheim Blvd. The hole was carried down to 5690 ft. to test Terminal and Ford zone possibilities but is now plugged back to complete in the Ranger. Neither lower horizon carried any oil.

Rosecrans Activity Reaches New Peak

The excellent production performance of southerly and southwesterly outpost wells in the Rosecrans field leads engineers to believe the O'Dea zone productive limits are yet far from reached and has resulted in the number of active projects increasing to 13.

F. E. Fairfield, after overcoming serious mechanical trouble, obtained 1000 bbls. in Able No. 1 at the west bend in Main St.; while farther to the east, Bankline Oil Co.'s jinx well, Kirby No. 1, is attempting to loosen stuck drill pipe after coring much good oil sand to 7622 ft. in the redrilled hole.

Superior Oil Co. is making a deep test of Maxwell No. 12, the last reported depth being 8720 ft.

Drilling Below 5500 Ft. 2nd L. B. Deep Test

Geo. Parry & Associates, Parry No. 1, deep test of the easterly portion of the Long Beach field, is well past the halfway mark in its attempt to find 10,000 ft. production, latest reports placing the bottom below 5500 ft. This is probably the first well ever started with the intention of drilling to such a depth to be equipped with a wood derrick.

Second San Pedro Try Is Abandoned by Hogan

Hogan Petroleum Co. has, temporarily at least, given up its search for oil on the Burkhard lease adjoining the Fletcher Refinery on San Pedro- Wilmington Road. Well No. 2 was abandoned at 3734 ft. after passing through an interval of vertically dipping shales and entering a gray sand body.

Burkhard No. 1 was abandoned in a fault at 2556 ft. in October of this year and the second well was located after drilling four shallow core holes.

Richfield Dominguez Surprise Abandonment

Somewhat of a surprise to the industry was Richfield Oil Co.'s abandonment of Dominguez Estate No. 1, wildcat located southeast of the Dominguez Hill field and north of the northwest extension of the Long Beach field. Micropaleo examination of the cores indicated the well to be too low to justify further drilling and work was stopped at 6954 ft.

San Joaquin Valley

Richfield Pulls Liner In Tupman Discovery Well

In an attempt to recomplete with a more favorable gas-oil ratio, Richfield Oil Corp. is pulling liner in Tupman Western No. 1, discovery well of the new Tupman field a mile east of Elk Hills. The well was finished at 8677 ft. last month flowing at a daily rate of 3752 bbls. of 44 gravity oil and 18,000,000 cu. ft. of gas. Much difficulty is being encountered in removing the steel liner but the job is about finished, and with good luck the well should be back on production by the first of the year.

Shell Finds Showings Northwest of Canal Field

The doubtful distinction of having oil showings without finding any bodies of good oil sand has been the lot to date of the Shell Oil Co.'s KCL B-87, sec 4, 30-25 wildcat well located two miles northwest of the Canal field. Stringers of sand with a good cut were picked up in the Stevens zone at 8975 ft. and again below 10,000 ft. but nothing yet has had the appearance of being commercially productive. Last reported depth is 10,300.

Potrero Hills Test Flows 5,000,000 Cu. Ft.

After many months of drilling and testing, Richfield Oil Corp. completed its Solano county wildcat, Potrero Hills No. 1, as a 5,000,000 cu. ft. gasser . The well had been taken down to 5334 ft. seeking possible oil sands after a near disastrous blow out had proved the presence of commercial gas at 3200 ft. Formations are now open in a 40 ft. interval above the redrilled bottom of 2368 ft.

The new gas discovery is located in sec. 10, 4n-1w, 12 miles west of the Rio Vista field and is the nearest commercial supply to the San Francisco Bay markets.

Cole's Levee Field Gets Two New Wells

That the newly discovered Cole's Levee field will not long be a one well field is indicated by the starting of new projects by Ohio Oil Co. and Standard Oil Co. Ohio is preparing to spud in KCL F-2 one location north of its discovery well in the northeast corner of sec. 10, while Standard has announced the location for KCL No. 20-1 a mile to the west in sec. 9; both in township 31 south, range 25 east.

Standard Tries Deep Greeley Extension

Attempting to extend deep Greeley production southwest into sec. 30, 29-26, Standard Oil Co. has erected a rig for a new well to be known as KCL No. 12-6. Within the proved area, the company is drilling two lower zone wells, while at the south edge, Fleishauer Comm. No. 2 is making another flow test from the plugged depth of 11,590 ft. Foundations are in for KCL No. 11-17 in sec. 18, 29-26.

Kettleman Hills, North Dome, with only two operators, is the San Joaquin Valley's leading field in drilling activity and in production. Its daily yield is 60,000 bbls., second only in California to Wilmington's 97,000 bbls.

Two New Wildcats For Upper Kern River

Five miles southeast of the Round Mountain field, two new wildcats have been spudded in recently. Off to the first start was Jules Rufener with his Julianne No. 1 in sec. 2, 29-29 while within two days Shell got under way with S. P. L. No. 1 in sec, 7, 29-30. Both wells are below 1400 ft. in depth.

Richfield, Tidewater Drill at South End

Two wells are actively drilling in the south end of the San Joaquin Valley. Richfield Oil Corp. KCL No. 1, deep edge test of the Wheeler Ridge field, is coring ahead below 9300 ft. in siltstone, having found no oil sand below the Veeder zone. A formation tester run on that horizon from 8520 to 8710 ft. recovered 75 stands of fluid, 50% of which were 40 gravity oil.

Tide Water Associated Oil Co., S. P. No. 2, located in sec. 15, 11-19 on Tejon Flats, is coring below 5850 ft. after topping the Santa Margarita between 4100 and 4150 ft.

In the Grapevine area, The Petrol Corp. is planning to resume operations on Reserve-Petrol No. 33-5, now standing idle at 6988 ft.

No Vedder Found In Eastmont No. 9-28

Eastmont Oil Co., well No. 9-28 in sec. 9, 28-29, was recently abandoned at 1850 ft. No Vedder zone was present, the drill passing directly into the Walker formation at 1417 ft. It is believed the well intersected a fault.

SAN JOAQUIN VALLEY WILDCATS

Area	Well	No.	Section	Depth	Status
Fresno County					
Coalinga	American Oil Fields, Inc.	1	16, 19-15	250	Idle
	Foreign Oil Co., Bush	1	6, 21-15	225	Drilling
	Jarvis, Leo P.	2	14, 20-14	218	Idle
	Progressive Oil Co.	3	20, 19-15	320	Drilling
	Stuart Oil Co., Stuart	1	12, 21-14	1175	Drilling
	Tide Water Assoc. Oil Co., Fleishacker	1	1, 19-15	7000	Drilling
Jacalitos Hills	Dauphin Dev., Ragan	1	30, 21-14	4475	Drilling
Mendota	Pierce, Cyrus, Shorb	1	16, 14-12	1580	Idle
Kern County					
Buttonwillow	Calif. Explor. Co., Salisbury	1	7, 29-24	9890	Drilling
Canal	Shell Oil Co., KCL	B-87	4, 30-25	10220	Drilling
Devils Den	Gibson Oil Co., Alferitz	3	14, 25-18	1230	Testing
	Goodrum, Geo., Baron	1	24, 25-18	1210	Idle
Edison	Hillview Oil Co., El Tejon	1-A	27, 30-30		Rigging up
	Renner & R.H.L. Oil Co.	1	27, 30-30	2320	Drilling
Elk Hills	Richfield Oil Corp., Tup.-W	1	32, 30-25	8677	Pulling liner
Famosa	Shell Oil Co. KCL	A-58-8	8, 27-26	9297	Abandoned
Fruitvale	The Texas Co., C.W.L.	1	7, 29-27	10157	Abandoned
Grapevine	Petrol Corp., Reserve	33-5	33, 11-19	6988	Idle
	Richfield Oil Corp.	KCL-1	28, 11-20	9220	Drilling
	Tide Water Assoc. O. Co., S.P.	2	15, 11-19	5450	Drilling
McClung	Superior Oil Co.	KCL-12	3, 30-26	9230	Drilling
McVan	Gilstrap, F. M., Carter	1	7, 27-27	1960	Abandoned
Mt. Poso	Vendome Oil Co.	1	28, 26-28		Rigging up
	Violette, Milburn	1	27, 26-28	1415	Pumping
Midway	Fried, Julius	1	34, 32-24	5031	Testing
Union Ave.	Richfield Oil Corp., Union Ave.	1	6, 30-28	8340	Drilling
Upper Kern River	Rufener, Jules., Julianne	1	2, 29-29		Rigging up

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E. Coalinga Awaits Cagle Results

Extension of the Coalinga Eocene Pool to the north is soon to be an accomplished fact if the high hopes held for Superior Oil Co.'s Cagle No. 1 are realized. Located near the south quarter of sec. 6, 20-16, the outpost is drilling below 6300 ft. and should soon pick up the Gatchell sand if present. Completion of Cagle No. 1 would extend production about a mile.

Six miles north, Tidewater Associated's Fleishacker No. 57-1 is approaching 7200 ft. in depth, the formation rumored to be Cretaceous.

Within the proved area, Superior Oil Co. after some mechanical difficulty finished Coalinga Fee No. 2 at 7187 ft. with initial gauge of 947 bbls, in 14½ hours. Gravity of the crude was 32.3 and the water content was 0.2%. The well is in the southwest quarter of sec. 7 and offsets Robert S. Lytle properties.

The Robert S. Lytle organization is drilling two wells and is starting a third, while the field's only other operator, Standard Oil Co., is drilling one and is rigging up another.

McClung Wildcat Heads for Vedder

Without hesitation, Superior Oil Co.'s third McClung wildcat, KCL No. 12, passed up the upper Miocene zone in its quest for the 11,500 ft. Vedder horizon. Little if any coring has been done to date and excellent time has been made to present bottom of 9400 ft. The well is located three miles southeast of the Greeley field in sec. 3, 30-26.

Gibson Pumps Devil's Den Well

Pumping 100 bbls. gross fluid, Gibson Oil Co. recently completed its No. 3 well on the old Standard Oil Co. Alferitz lease at Devil's Den. Gravity of the oil approximates 17 and the cut varies widely between 50% and 95%. The well, drilled with cable tool equipment, was bottomed at 1230 ft. and plugged to 1187 ft. Casing is perforated below 1085 ft.

Buttonwillow Test Cores Below 10,000 Ft.

Far the deepest test ever made of the Buttonwillow area is that of California Exploration Co., now drilling below 10,000 ft. on the Salisbury lease in sec. 7, 29-24. Although gas showings have been noted, the project will continue in search of the lower Miocene sands found productive at Wasco, Rio Bravo and Greeley.

Texas Co. Enters Shale Hills Area

Hoping to obtain favorable geological information, The Texas Co. has spudded a core hole, Solomon No. 1, in the southeast quarter of sec. 13, 27-18. Frank E. Abbott holds an interest in the play which is said to include the rig he erected some months ago in sec. 18, 27-19.

Don Angle Will Core for Vedder

Don Angle, deepening the old Bargol Oil Co. Claflin No. 2 in sec. 10, 27-27, (McVan) is reported as drilling in the Jewett Silt at 3325 ft. and preparing to core for Vedder zone.

Frank M. Gilstrap abandoned Carter No. 1, sec. 7, 27-27, at 2295 ft. after coring a 25 ft. gray sand interval.

Buttes Oilfields Markets Gas

With the completion of connections to P. G. & E. gas mains, Buttes Oil Fields, Inc. is now assured of a permanent market for its gas and is proceeding immediately with the drilling of another well in the Marysville Buttes field.

Famoso Well Proves Duster

After pentrating the full extent of the valley sediments, Shell Oil Co.'s KCL No. A-58, sec. 8, 27-26, was abandoned in the basement at 9297 ft. No sand body in the Pliocene, Miocene or Eocene was deemed worthy of a test.

Camp-West-Lowe 1 Abandoned by Texaco

Finally disproving the presence of oil immediately northwest of the Fruitvale field, The Texas Co. abandoned Camp-West-Lowe No. 1 at 10,156 ft. in basement rock. Both the Greeley and Rio Bravo horizons were passed through and found barren. After topping the hard rock at 10,122 ft. a string of drill pipe was lost resulting in a long sidetracking job which finally proved useless when what was thought to be a volcanic intrusion turned out to be the real basement.

Wesco to Drill McKittrick Test

Wesco Petroleum Co., headed by C. A. Palmer of San Francisco, is preparing to drill in sec 34, 30-22 at McKittrick. The company is said to be affiliated with W.P.W. Petroleum Co., which has drilled several prospect wells in the Mount Poso area.

In section 2, 30-21, Hall-Baker Co. is drilling Williams No. 1, while in sec. 7, 30-22, Standard Oil Co. is preparing to drill two offsets to Franco-Western's recently completed 350 bbl. well.

One String Running In Ten Section Field

Reducing for the time being, its Ten Section drilling activity, Shell Oil Co. is running only one string of tools in the entire field. Completing No. A-72, sec. 29, 30-26, at 8220 ft. with production of 2982 bbls., crew and equipment have been moved to No. B-81 in the same section.

Coastal District

Tide Water Completes Deepest Well in Ventura

In completing Hartman No. 7 at 11,070 ft., Tide Water Associated Oil Co. bettered their own depth record for the Ventura Avenue field set last month by McGonigle No. 11 at 10,935 ft. The new well exceeds the former recorder holder in depth only, however, as the McGonigle produced 1861 bbls. a day while the Hartman's initial was at the rate of 900 bbls. with a high percentage of water. The two are located approximately 800 ft. apart at the north side of the field.

Well No. 2 of the Lloyd Corp., located near the east end of the field, was swabbed for several days during which time the well made several small heads, but the fluid consisted mostly of water and operations have been temporarily suspended. The 7303 ft. hole, plugged to 7060 ft., has 9⅝ in. casing cemented at 6440 ft.

Ridge Oil Recovers Drill Pipe Fish

Ridge Oil Co., whose wildcat well adjoining the Rincon field on the north has been tied up with a stubborn fishing job, has cleared the hole to bottom and is again drilling ahead. Formation at last reported depth of 7325 ft. was hard shale. Within the Rincon field, Chanslor Canfield-Midway Oil Co. is preparing to complete No. B-18 at 4320 ft. after cementing casing at 3711 ft.

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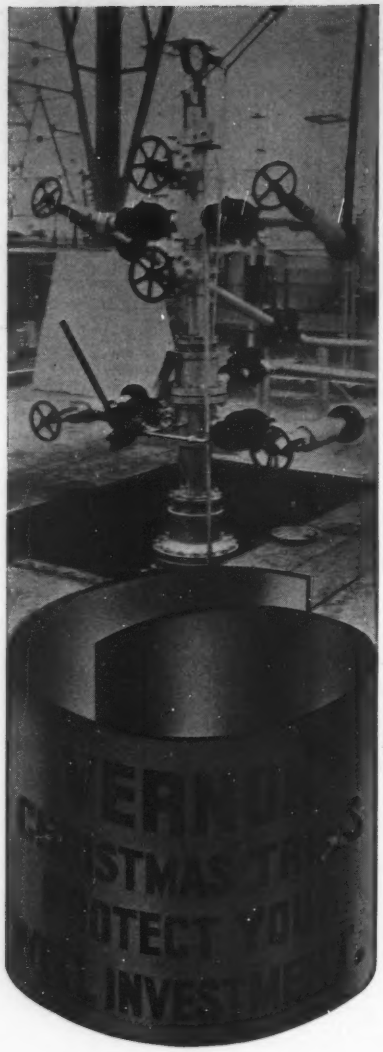

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Cannon Acquires Calumet Properties

Larry D. Cannon has acquired the former Calumet properties in the Shiells Canyon field. Several of the 14 wells involved in the deal will be reconditioned, after which Mr. Cannon plans a conservative drilling program.

Fred Cole Completes Well in Santa Maria

Finishing well No. 18 at 5545 ft., Fred E. Cole of Santa Barbara, obtained initial production of 1925 bbls. The oil, which was practically free of water, tested 15 gravity. Located in the northwest corner of lot 5 of the Paderewski subdivision, the well is one of the most southwesterly in the field. The Monterey was topped at 5100 ft. and the Franciscan struck at 5535 ft. Near the top of the list in activity a year ago, the Santa Maria Valley field is now left without a single drilling well.

Speik Oil, Chappuis 1 Pumps 115-bbl. in Sespe

Pumping 115 bbls. daily from 200 ft. of open hole to bottom at 3637 ft., Speik Oil Co. completed Chappuis No. 1 as the best recent producer in the entire Sespe area of Ventura county. Small quantities of oil were found in lower Miocene sands but the hole was carried down into the Sespe red beds which were topped at 3428 ft. A water string was cemented at 3436 ft. The well had stood idle for some months at 3440 ft. Location is sec. 33, 5-19.

With interest already increasing, Dr. Speik's new completion should further stimulate activity in this of late somewhat neglected oil country. Union Oil Co., which holds offset acreage, is rumored to be contemplating a new well.

NORTHERN COUNTIES WILDCATS

County	Well	No.	Section	Depth	Status
Madera	Amerada Pet., Core Hole	A	32, 11-12	2810	Drilling
Monterey	Anderson, A. A., Hillman	1	15, 24-14	4004	Testing
Solano	Richfield Oil Corp., Potrero	1	10, 4-1	5334	Testing
Stanislaus	Orestimba Oil Co.	1	12, 7-7	1550	Drilling

COASTAL COUNTIES WILDCATS

Area	Well	No.	Section	Depth	Status
Santa Barbara County					
Capitan	Litho Oil Co., Rhode I.	1	4, 4-30		Rig
Carreaga	Douglas-Stratton Oil Co.	1	8, 8-33	7240	Testing
Foxen Canyon	Richfield Oil Corp., Tinaquaic	1	36, 9-32	2550	Drilling
Gaviota	Gaviota Oil Co., Hollister	1	35, 5-33	3215	Idle
Gato Ridge	Barnsdall Oil Co., Mag.	5	9, 8-32	3035	Idle
	Pezzoni	1	15, 8-32	4494	Idle
Summerland	Oil Group, Inc., Hyland	1	16, 4-26		Rig
San Luis Obispo County					
Edna	Loma Grande Oil Co., Lewis	1	28, 31-13	2125	Idle
Elk Horn	Calif. Pet. Prod. Co., Irons	1	19, 10-24	1710	Plugging
	Lee, Harry, Defiance	1	7, 32-22	290	Idle
	Western Plains Oil Co.	1	7, 31-21	4010	Idle
Huasna	Hancock O. Co.,Scherer-Dickes	1	30, 12-33	5593	Idle
Paso Robles	Vanguard Oil Co., Clark	1	26, 27-14	4950	Idle
	Epco., Inc.	1	27, 26-13	3100	Drilling
Ventura County					
Ojai	High Mesa Oil Co.	1	16, 4-22	1770	Drilling
Red Mountain	Martin, J. W.	3	15, 4-21	1250	Idle
Sespe	Brain Oil Co., Cosby	1	14, 4-19	1120	Cleaning out
	Claran Oil Co., Hardison	1	22, 4-20	1875	Drilling
	Commander Oil Co.	7-F	13, 4-19	575	Idle
	Crystal Oil Co., Crystal	1	35, 5-20	250	Idle
	Ivers, H. A., Kentuck	14	1, 4-20		Location
	Merchants Pet., Cochran	8	1, 4-20	1525	Drilling
	Speik Oil Co.	1	33, 5-19	3637	Testing
	St. Louis	1	1, 4-20	1880	Drilling
Shiells Canyon	The Texas Co., Shiells	136	4, 3-19		Rig
	El Rancho Oil Co., Elkins	2	9, 3-19		Rigging up
South Mt.	Clipper Oil Co.	1	17, 3-20		Rig
Tar Creek	Section 20 Oil Co.	1	20, 5-19	2390	Drilling
Timber Canyon	Stallings, Senter, Ahlberg	1	24, 4-21	1445	Idle
Ventura	Ventura Drilling Co.	1	10, 3-23	2100	Drilling
	Ventura Exploration Co., Sexton	1	30, 3-22	9511	Testing

LAUGH THIS OFF

No less an authority than **Ed Leabow** tells us that many an oil man who has never been to sea has nevertheless developed a rolling gait—from shooting craps.

And the skeleton in his family closet is frequently nothing but an old pair of bones.

Miller Huggins, incidentally, is one shaker who didn't emanate from Pennsylvania.

On the other hand, **Ernie Parks** brings us a heart breaking story about a poor pumper who hung up his stocking last Christmas and didn't get a thing but a notice from the health department.

Ernie, you will remember, is the lad who went to one of these wrestling matches a while ago, and when he came out was asked what he thought of the show. "Well," he mused, "If it had rained I would have been soaked twice."

A short time ago, we learn via the grapevine, **Cy Rubel** was host to a skating party at the new Westwood rink, from which **Wendell Jones** came away complaining that the back of his lap hurt.

Skating in California, by the way, is not such an innovation as some people think. Away back in the pioneer days of the oil industry it was quite common around pay day for the boys to go on a skate.

And some of them could cut queer figures, too, although most of them preferred their ice in tall glasses.

Now comes **Dub Russell,** the Bobby Jones of the Petroleum Accounts Society, advancing the perfectly plausible theory that the game of golf was begun by a Scotchman who found a diamond in the rough.

While the boys were scarring the good earth in an atrocious manner out at Brentwood last Friday, **Dave Kilgour** lashed out an eighty yard drive that ended up in a gopher hole. "What do I use now?" he asked the caddy. "Better try a vacuum cleaner," replied the bearer of the white man's burden.

Dave was so mad he would have taken a sock at him, but he didn't know which club to use.

Roy Hornidge, we note, is fully recovered from his recent indisposition, and was out there swinging a mean brassie again. He is one of the best sports in the industry. For many years he was a top notch racket wielder, and in his day played against many of the national ranking tennis players. Roy is of the opinion that abandoned leases will all eventually revert to their original wild state and become golf courses.

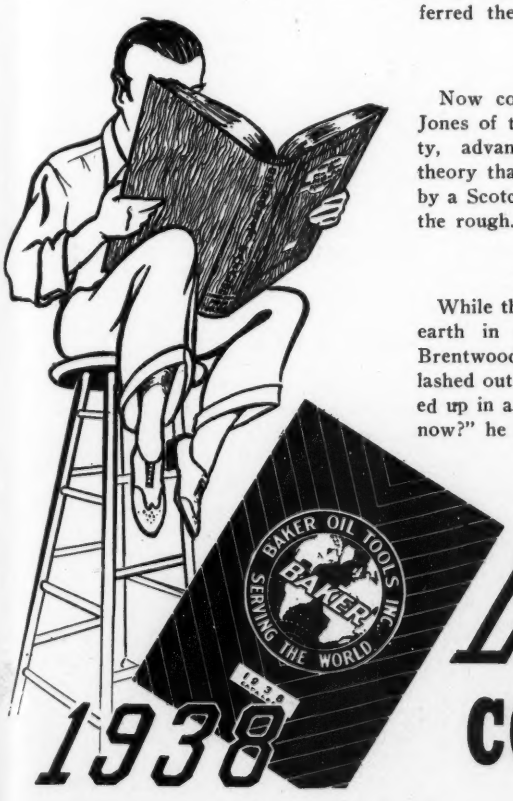
It would, perhaps, be better, in this connection, if we refrain from naming the oil man who taught his wife to play golf a short time ago, and now proudly proclaims that she is going round in less and less.

With which we return to the festive season, and **Joe Scanlon's** bright crack about the plant electrican who served his apprenticeship trimming Christmas trees.

And from one of our field operatives comes a report that the wife of a certain production foreman is having a hard time trying to find Christmas gifts for the children that their father will play with.

With which few remarks we again pause to wish our readers a wet and merry Christmas, and a moist and happy New Year.

And all the complaints of the season.



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Oil Men's Calendar

C.N.G.A. Meeting First Thurs. Each Month.

January, 1939

9-13—Society of Automotive Engineers, Annual Meeting, Detroit, Mich.

February

20-24—12th National Asphalt Conference auspices of The Asphalt Institute, Biltmore Hotel, Los Angeles.

March

22-24—The American Association of Petroleum Geologists 24th annual meeting, Oklahoma City, Okla., Skirvin Hotel, headquatrers.

April

24-29—Oil World Exposition, Inc., Houston, Texas.

City Plan Commission of Spokane, Washington has been directed by the city council to investigate and report upon a proposal to limit the number and location of gasoline service stations in the city.

Map of Kings River

A map of Kings River from Piedra, Fresno County, Calif., to a point 32 miles upstream, with tributaries, has recently been released by the Geological Survey, United States Department of the Interior. The scale of this map is 2,000 feet to the inch. Topography is represented with a contour interval of 20 feet on land and 5 feet on the river surface.

This map is published in 6 sheets, 5 plan and 1 profile, each 22 by 28 inches. It may be consulted at the field office of the Geological Survey, Federal Building, Sacramento, or may be obtained from the main office of the Geological Survey at Washington, D. C., for 10 cents a sheet or 60 cents for the set.

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